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JULY 2020

# **BELLA VISTA PRECINCT MASTERPLAN BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT**

wsp





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## Bella Vista Precinct Masterplan Biodiversity Development Assessment Report

Landcom

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| REV | DATE       | DETAILS                                         |
|-----|------------|-------------------------------------------------|
| A   | 17/04/2019 | Draft                                           |
| B   | 31/05/2019 | Final                                           |
| C   | 21/08/2019 | Final issue – updated legal description of lots |
| D   | 02/03/2020 | Final issue – response to submission comments   |
| E   | 20/03/2020 | Final issue – response to APP comments          |
| F   | 17/04/2020 | Final issue – response to Sydney Metro comments |
| G   | 09/06/2020 | Final issue – response to APP comments          |
| H   | 10/07/2020 | Final issue – response to APP comments          |

|              | NAME                          | DATE       | SIGNATURE                                                                            |
|--------------|-------------------------------|------------|--------------------------------------------------------------------------------------|
| Prepared by: | Mark Stables<br>Julia Emerson | 31/05/2019 |  |

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|              |                |            |                                                                                    |
|--------------|----------------|------------|------------------------------------------------------------------------------------|
| Reviewed by: | Alex Cockerill | 31/05/2019 |  |
| Approved by: | Alex Cockerill | 31/05/2019 |  |





Our ref: PS112427-ECO-REP-001 RevH\_final

17 June 2020

Georgia Welsh  
Level 7  
116 Miller Street  
North Sydney NSW 2060

Dear Ms Welsh

**Bella Vista Precinct Masterplan  
Biodiversity Development Assessment Report**

WSP has provided Revision H of the Bella Vista Precinct MasterPlan Biodiversity Development Assessment Report in response to submissions received from Environment, Energy and Science (EES) Group (formerly Office of Environment and Heritage), The Hills Shire Council (THSC) and Sydney Metro on the 2<sup>nd</sup> March and 15<sup>th</sup> of April 2020.

In addition, WSP has responded to Biodiversity Development Assessment Report requirements as outlined in Table 25 and Table 26 of the Biodiversity Assessment Method (BAM) 2017 and required under section 6.12 (a) and section 6.15 of the *Biodiversity Conservation Act 2016* in Appendix G..

WSPs response to submission comments has been summarised below in Table 1.1, each comment and the section in the report with the relevant changes is outlined.

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Table 1.1 A summary of submission comments and WSP response

| SUBMITTED BY                                                                        | SUBMISSION COMMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | WSP RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | SECTION ADDRESSED    |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Environment, Energy and Science Group (formerly Office of Environment and Heritage) | <p>The proposal will lead to the loss of 1.57 ha of the critically endangered ecological community (CEEC), Cumberland Plain Woodland. In accordance with the Biodiversity Conservation Act 2016, all attempts must first be made to avoid impacts.</p> <p>Section 8.1.2 of the Biodiversity Assessment Method (BAM) requires the assessor to describe how the proposal has been designed to avoid and minimise impacts. This includes describing how the clearing of native vegetation has been avoided by reducing the clearing footprint of the project.</p> <p>In response to this requirement, Table 8.1 of the BDAR states that the impacts have been avoided 'where practical'. EES considers that all attempts should be made to avoid impacts, and where this is not</p> | <p>The rezoning and preparation of the Bella Vista Structure Plans exhibited between 7 December 2015 and 28 February 2016 was informed by initial ecological assessments carried out to determine biodiversity values across the Bella Vista Station Precinct.</p> <p>Bella Vista Station Precinct was rezoned by NSW Department of Planning, Industry and Environment on the basis that the site carries significant strategic merit as housing and employment providers and would contribute to the meeting of state government targets/objectives. Avoiding impact to Cumberland Plain Woodland entirely would not allow for state government priorities/policies to be realised.</p> <p>Further design changes which prioritised the utilisation of areas of native vegetation which holds the lowest biodiversity value and minimising impact to areas with highest biodiversity risk weighting (within design and project limitations) were made following and in response to WSP biodiversity surveys in 2018 and 2019.</p> <p>Cumberland Plain Woodland has the highest biodiversity risk weighting and impacts have been avoided and minimised through detailed design resulting in a total of 1.01 hectares retained in an open space zoning.</p> | Section 8, Table 8.1 |

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| SUBMITTED BY | SUBMISSION COMMENTS                                                                                                                                                                                                                                                                    | WSP RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SECTION ADDRESSED                                |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
|              | possible, the BDAR should provide justification for why the footprint cannot be further reduced to avoid clearing a CEEC. It is considered that appropriate justification has not been provided.                                                                                       | <p>Through avoidance of riparian areas, impacts to River-flat Eucalypt forest endangered ecological community have been reduced to 0.06 hectares. Most of this community (0.27 ha) occurs along Elizabeth Macarthur Creek and will be retained post development and subject to riparian management.</p> <p>Future applications for the detailed design and construction of civil infrastructure and built form would further investigate the potential for the retention of native vegetation within allotments and open space parkland areas.</p> <p>Residual impacts unable to be avoided will be adequately offset via Biodiversity Offsets Scheme.</p> |                                                  |
|              | In addition, the BDAR does not include a number of maps or information which are required by the Biodiversity Assessment Method (BAM), and they should be included in future BDARs: quantitative evidence to substantiate identification of a PCT (as per section 5.2.1.12 of the BAM) | In accordance with section 5.2.1.12 of the BAM, PCT justification is provided using quantitative analysis of Vegetation Integrity Plots collected during WSP field surveys utilising the BioNet Vegetation Classification Community Tool for each PCT recorded.                                                                                                                                                                                                                                                                                                                                                                                            | Section 5.2 (Table 5.2, Table 5.4 and Table 5.6) |
|              | Assessment of direct impacts including type, frequency, intensity, duration and consequence of impact (as per section 9.3.1.2 and 9.3.2.4)                                                                                                                                             | <p>Section 9.3.1.2 and 9.3.2.4 of the BAM relates to mitigation measures which have been detailed further in Section 10 (see below).</p> <p>A summary of direct and indirect impacts likely to result from the Project has been provided. This summary details the impact, consequence, extent, frequency, duration and timing in accordance with section 9.1.1.2 of the BAM</p>                                                                                                                                                                                                                                                                           | Section 1.1, Table 9.4.                          |
|              |                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                  |

| SUBMITTED BY            | SUBMISSION COMMENTS                                                                                                                                                                                                                                        | WSP RESPONSE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | SECTION ADDRESSED                  |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
|                         | Identification of measures to mitigate or manage impacts, including techniques, timing, frequency and responsibility; identify measures for which there is risk of failure; evaluate the risk and consequence of any residual impacts (as per section 9.3) | Section 9.3.1.2 and 9.3.2.4 of the BAM details mitigation measures. Mitigation measures have been developed to address potential impacts which may result from the Project including (but not limited to) the removal of hollow-bearing trees, transport of weeds/pathogens and noise, dust and light spill. Mitigation measures for each potential impact has been outlined in Section 10 and detailed in terms of project phase, timing and responsibility. A risk assessment for each potential impact has been carried out to evaluate the effectiveness of the mitigation measure recommended. | Section 10, Table 10.1, Table 10.3 |
|                         | map of impacts requiring offset (as per Table 26)                                                                                                                                                                                                          | All vegetation zones within the Subject Land require offset and have been shown in Figure 11.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Figure 11.1                        |
|                         | map and identification of impacts not requiring offset (or discussion of this where it's N/A) (as per section 10.3.2.2)                                                                                                                                    | All vegetation zones within the subject land generated a score Vegetation Integrity score of more than $\geq 17$ . In accordance with section 10.3.1.1 of the BAM, all vegetation zones require a biodiversity offset.                                                                                                                                                                                                                                                                                                                                                                              | Section 11.1.1                     |
|                         | map and identification of areas not requiring assessment (as per Table 26)                                                                                                                                                                                 | Identification of areas not requiring assessment has been provided in accordance with section 10.4 of the BAM and shown in Figure 9.4. These areas include Miscellaneous Ecosystems which do not meet the definition of native vegetation and cannot be assessed in accordance with BAM.                                                                                                                                                                                                                                                                                                            | Section 9.7, Figure 9.3            |
|                         | future vegetation integrity score for each vegetation zone (as per section 9.1.3).                                                                                                                                                                         | Current and future VI scores for each vegetation zone have been calculated using the BAM Calculator and provided,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Section 11, Table 11.1             |
| The Hills Shire Council | A riparian assessment for the Bella Vista precinct should be submitted, similar to                                                                                                                                                                         | Riparian Assessment for Bella Vista Precinct has been provided in Appendix F. Mitigation measures have been amended to reflect those                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Appendix F                         |



| SUBMITTED BY | SUBMISSION COMMENTS                                                                                                                                                                                                                                                               | WSP RESPONSE                                                                                                      | SECTION ADDRESSED |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------|
|              | that provided for Kellyville. Further progression of the Kellyville precinct SSDA and future Development Applications ought to comply with mitigation measures specified in the riparian assessment completed by EcoLogical Australia in support of the Kellyville precinct SSDA. | outlined in the Riparian Assessment completed by EcoLogical Australia in support of the Kellyville precinct SSDA. |                   |
| Sydney Metro | Minor grammatical updates                                                                                                                                                                                                                                                         | BDAR updated and issued as Rev F                                                                                  | Various Sections  |

Yours sincerely

A handwritten signature in black ink, appearing to read 'Alex Cockerill', followed by a vertical line.

Alex Cockerill  
Ecology National Team Executive





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# GLOSSARY

|                                  |                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Avoid                            | measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the BAM for operational guidance.                                                                               |
| BioNet Atlas                     | the OEH database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the TSC Act) and some fish.                                                                                                           |
| BioNet Vegetation Classification | the master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by OEH and available at <a href="http://www.environment.nsw.gov.au/research/Visclassification.htm">www.environment.nsw.gov.au/research/Visclassification.htm</a> . |
| Broad condition state            | areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.                                                                                                                                                            |
| BAM Credit Calculator            | the computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.               |
| Development site                 | an area of land that is subject to a proposed development application, application for approval.                                                                                                                                                                                                                                                                                  |
| Development footprint            | the area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials. The term development footprint is also taken to include clearing footprint of the project.                                                                                                                                       |
| Ecosystem credits                | a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development site.                                                                                                                  |
| Habitat                          | an area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.                                                                                                                                                                                                                             |
| High threat weed                 | plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.                                                                                                                                                                                                                                           |
| Hollow bearing tree              | a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.                         |

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IBRA region                     | a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.                                                                                                                                                                                                                                                                                                        |
| IBRA subregion                  | a subregion of a bioregion identified under the IBRA system.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Landscape attributes            | in relation to a development site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.                                                                                                                                                                                                                                                                                                             |
| Local population                | the population that occurs in the subject land. In cases where multiple populations occur in the subject land or a population occupies part of the subject land, impacts on each subpopulation must be assessed separately.                                                                                                                                                                                                                                                                                   |
| Minimise                        | a process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.                                                                                                                                                                                                                                                                                                                                                 |
| Mitchell landscape              | landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.                                                                                                                                                                                                                                                                                                                                                                                       |
| Patch size                      | <p>an area of intact native vegetation that:</p> <ul style="list-style-type: none"> <li>a) occurs on the development site or biodiversity stewardship site, and</li> <li>b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or <math>\leq 30\text{m}</math> for non-woody ecosystems).</li> </ul> <p>Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.</p> |
| Plant community type (PCT)      | a NSW plant community type identified using the PCT classification system.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Species credits                 | the 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.                                                                                                                                                                                                                                                                                                                              |
| Subject land                    | is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Threatened ecological community | means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.                                                                                                                                                                                                                                                                                                                                               |
| Threatened species              | critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.                                                                                                                                                                                                                                                                      |
| Vegetation class                | a level of classification of vegetation communities defined in Keith (2004). There are 99 vegetation classes in NSW.                                                                                                                                                                                                                                                                                                                                                                                          |
| Vegetation formation            | a broad level of vegetation classification as defined in Keith (2004). There are 16 vegetation formations and sub-formations in NSW.                                                                                                                                                                                                                                                                                                                                                                          |
| Vegetation integrity            | the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.                                                                                                                                                                                                                                                                                                                                                                                                       |

# ABBREVIATIONS

|               |                                                                                         |
|---------------|-----------------------------------------------------------------------------------------|
| BAM           | the Biodiversity Assessment Method 2017.                                                |
| BDAR          | Biodiversity Development Assessment Report                                              |
| BC Act        | the <i>Biodiversity Conservation Act 2016</i> .                                         |
| BC Regulation | the Biodiversity Conservation Regulation 2017.                                          |
| BOS           | Biodiversity Offset Scheme                                                              |
| EP&A Act      | the NSW <i>Environmental Planning and Assessment Act 1979</i> .                         |
| EPBC Act      | the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> . |
| Ha            | Hectares                                                                                |
| IBRA          | Interim Biogeographic Regionalisation for Australia                                     |
| MNES          | Matters of National Environmental Significance                                          |
| OEH           | The NSW Office of Environment and Heritage                                              |
| PCT           | Plant Community Type                                                                    |
| SAII          | Serious and Irreversible Impact                                                         |
| SSD           | State Significant Development                                                           |
| TEC           | Threatened Ecological Community                                                         |

# EXECUTIVE SUMMARY

This Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the NSW Biodiversity Assessment Method 2017 established under the *Biodiversity Conservation Act 2016* (BC Act) and provides an assessment of biodiversity values which occur within land known as Bella Vista Station Precinct.

The Bella Vista and Kellyville Station Precincts form part of a network of eight station precincts along the corridor of the NSW Government's Sydney Metro Northwest (SMNW). Both Station Precincts were identified by the NSW Government as a Priority Precinct to support and drive the urban renewal of rural residential land into a new urban environment. The Bella Vista Station Precinct site is wholly contained within the boundary of the Bella Vista Station Precinct as defined by the Schedule 2 State Significant Development Sites Map of State Environmental Planning policy (State and Regional Development) 2011 (SRD SEPP). The site is made up of 26 properties and has a total area of approximately 33.79 hectares.

Development consent will be sought for a concept development application pursuant to section 4.22(1) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) that sets out the concept proposal for each station precinct that comprises the following components:

- Land use strategy that identifies the overall allocation, quantum and location of land uses across the site including:
  - Residential dwellings comprising residential flat buildings and terraces
  - Non-residential land uses including retail and commercial
  - A new primary school
  - Public open space including public domain and parks and
  - Community facilities.

The project will have a residual impact on 1.85 ha of native vegetation within the development footprint comprising two native plant community types:

- PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial 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

Two threatened ecological communities listed under the BC Act and or EPBC Act are within the subject land. These are:

- Cumberland Plain Woodland in the Sydney Basin Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

No threatened flora species have been recorded or are considered affected by the project.

One candidate threatened fauna species, Southern Myotis, has been assumed present based on available habitat attributes. A total of 1.60 ha of habitat will be impacted for this species.

One SAI entity, Cumberland Plain Woodland, will be impacted because of the project. The impacts on this community have been reduced to 0.75 ha of moderate condition and 1.04 of poor condition vegetation. Given the small patch sizes, highly modified and fragmented nature of the vegetation type within the development footprint, the project impact on the threatened ecological community is unlikely to lead to a serious and irreversible impact.

Biodiversity offset obligations have been determined using the BAM calculator. The proposal will require a total of:

- 53 of ecosystem credits; and
- 38 species credits.

Assessments of impact significance were conducted for all Matters of National Environmental Significance (MNES) threatened species, populations and ecological communities considered likely to be affected by the proposal. Through these assessments, it was concluded that the project is unlikely to have a significant impact on any threatened species, population or ecological community, as such, a referral of this proposal under the EPBC Act is not required.

# 1 INTRODUCTION

This Biodiversity Development Assessment Report (BDAR) provides an assessment of biodiversity values which occur within land known as Bella Vista Station Precinct (henceforth referred to as the subject land) (Figure 1.1).

This BDAR has been prepared by accredited assessors under the *Biodiversity Conservation Act 2016* (BC Act) and specifically addresses the Biodiversity Assessment Method 2017 (BAM).

An overview of the project background, description and locality is provided below.

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## 1.1 PROJECT BACKGROUND

Under the Sydney Metro Northwest (SMNW) Places program, Landcom and Sydney Metro are working collaboratively with the Department of Planning, Industry and Environment, local councils, other government organisations and key stakeholders to develop the long-term vision and delivery program to guide the redevelopment and urban renewal of surplus government owned or controlled land around new SMNW station precincts.

SMNW Places will deliver vibrant and integrated precincts surrounding the new Bella Vista and Kellyville metro stations that will facilitate the renewal and delivery of a greater supply and diversity of housing, new employment opportunities and new public and community facilities.

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## 1.2 PROJECT DESCRIPTION

The Bella Vista and Kellyville Station Precincts along the corridor of the NSW Government's SMNW. Both Station Precincts were identified by the NSW Government as a Priority Precinct to support and drive the urban renewal of rural residential land into a new urban environment.

Bella Vista and Kellyville Station Precincts are envisaged to provide for up to 9,400 and 1,000 new jobs respectively and the delivery of up to 8,400 new homes, shared between both precincts.

This report has been prepared to specifically address assessment of biodiversity values for the Bella Vista Station Precinct.

### 1.2.1 BELLA VISTA STATION PRECINCT

The Precinct spans alignment of the SMNW corridor that consists of an approximate 1.4 km stretch of government owned land, extending from Celebration Drive in the south to Memorial Avenue in the north and generally bound by Old Windsor Road and existing private land holdings to the west and Elizabeth Macarthur Creek to the east (Figure 1.1).

The Precinct is occupied by new road and railway infrastructure associated with former State Significant Infrastructure (SSI) approvals, SSI 5414 and SSI 5100, including the new Bella Vista Station which is located at the southern end of the Precinct. Other existing site activities associated with the SSI approvals include a large multi-storey commuter car park immediately north of the station.

Lands adjacent to the alignment of Elizabeth Macarthur Creek and small areas north of Balmoral Road contain scattered stands of existing native vegetation. The remainder of the Precinct is predominantly vacant and clear of vegetation.

### 1.2.2 CONCEPT SSD SITE DESCRIPTION

The Bella Vista Station Precinct Concept SSD Application site is defined as land owned by, or under the control of, Sydney Metro. This includes lands under the ownership of Office of Strategic Lands (OSL).

The Bella Vista Station Precinct site is wholly contained within the boundary of the Bella Vista Station Precinct as defined by the Schedule 2 State Significant Development Sites Map of State Environmental Planning policy (State and Regional Development) 2011 (SRD SEPP).

The site is made up of 26 properties and has a total area of approximately 33.79 hectares. The legal description of the site is outlined below in Table 1.1.

Table 1.1 Bella Vista Station Precinct property description

| NO. | LOT NO. | PLAN NO.  | OWNER                            | OWNERSHIP  |
|-----|---------|-----------|----------------------------------|------------|
| 1   | 104     | DP1252968 | Sydney Metro                     | Government |
| 2   | 102     | DP1252968 | Sydney Metro                     | Government |
| 3   | 101     | DP1252968 | Sydney Metro                     | Government |
| 4   | 110     | DP1252968 | Sydney Metro                     | Government |
| 5   | 111     | DP1252968 | Sydney Metro                     | Government |
| 6   | 100     | DP1252968 | Sydney Metro                     | Government |
| 7   | 110     | DP1250875 | Sydney Metro                     | Government |
| 8   | 111     | DP1250875 | Sydney Metro                     | Government |
| 9   | 135     | DP1250868 | Sydney Metro                     | Government |
| 10  | 134     | DP1250868 | Sydney Metro                     | Government |
| 11  | 30      | DP1071715 | Sydney Metro                     | Government |
| 12  | 6       | DP1244850 | Planning Ministerial Corporation | Government |
| 13  | 7       | DP1244850 | Planning Ministerial Corporation | Government |
| 14  | 8       | DP1244850 | Planning Ministerial Corporation | Government |
| 15  | 9       | DP1244850 | Planning Ministerial Corporation | Government |
| 16  | 10      | DP1244850 | Planning Ministerial Corporation | Government |
| 17  | 106     | DP1252968 | Sydney Metro                     | Government |
| 18  | 114     | DP1252968 | Sydney Metro                     | Government |
| 19  | 103     | DP1252968 | Sydney Metro                     | Government |
| 20  | 107     | DP1252968 | Sydney Metro                     | Government |
| 21  | 109     | DP1252968 | Sydney Metro                     | Government |
| 22  | 108     | DP1252968 | Sydney Metro                     | Government |
| 23  | 131     | DP1252968 | Sydney Metro                     | Government |
| 24  | 130     | DP1252968 | Sydney Metro                     | Government |
| 25  | 112     | DP1252968 | Sydney Metro                     | Government |
| 26  | 105     | DP1252968 | Sydney Metro                     | Government |



### 1.2.3 CONCEPT SSD APPLICATION SCOPE

The Concept SSD Applications will seek development consent for generally the same aspects, with the exception of the Bella Vista Station Precinct that will also seek consent for the indicative location of a future primary school.

Each Concept SSD Application will set out the concept proposal for the future development of each station precinct. Each application is only required to demonstrate and consider the likely impacts associated with concept proposal, not the likely impact of any development that would be subject to a separate development application.

Development consent will be sought for a concept development application pursuant to section 4.22(1) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) that sets out the concept proposal for each station precinct that comprises the following components:

- Land use strategy that identifies the overall allocation, quantum and location of land uses across the site including:
  - Residential dwellings comprising residential flat buildings and terraces
  - Non-residential land uses including retail and commercial
  - A new primary school
  - Public open space including public domain and parks and
  - Community facilities.
- Urban Design Guidelines that includes built form design principles, guidelines and controls, including maximum building heights and street wall setbacks and heights.
- Allocation of maximum GFA across the site for each development block and for specific land uses, including allowable GFA transferred from roads and open space to identified development lots pursuant to clause 8.3 of The Hills Local Environmental Plan 2012.
- Street hierarchy and layout, including the identification of pedestrian and vehicular movement and access arrangements, and the indicative location and configuration of new streets and intersection connections to the existing road network.
- Identification of criteria or thresholds for subsequent development stages to be assessed as State Significant Development pursuant to section 4.37 of the EP&A Act.

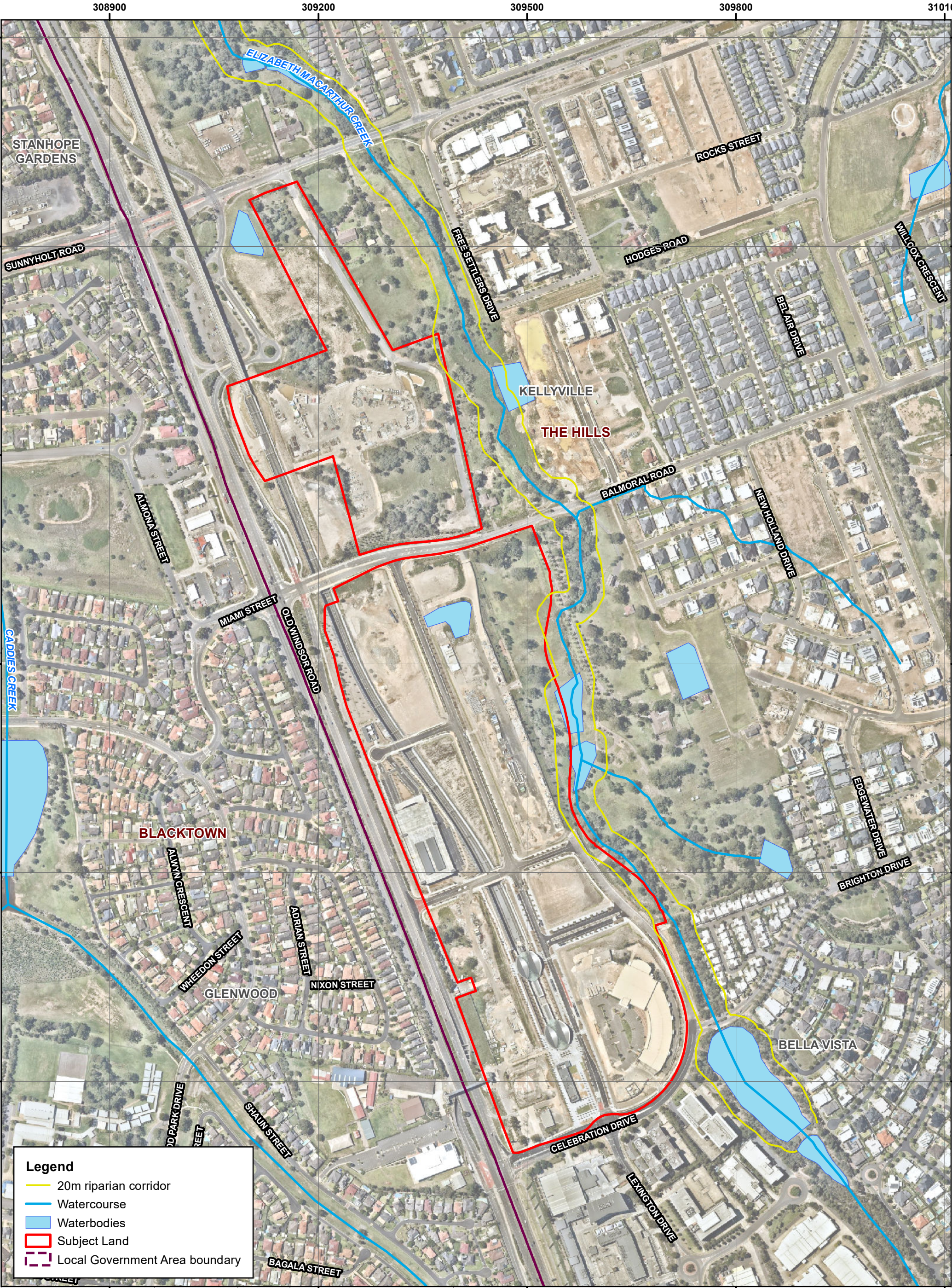
The concept SSD application's will not seek development consent for any physical works. All development set out in each concept proposal will be subject to a separate approval pathway



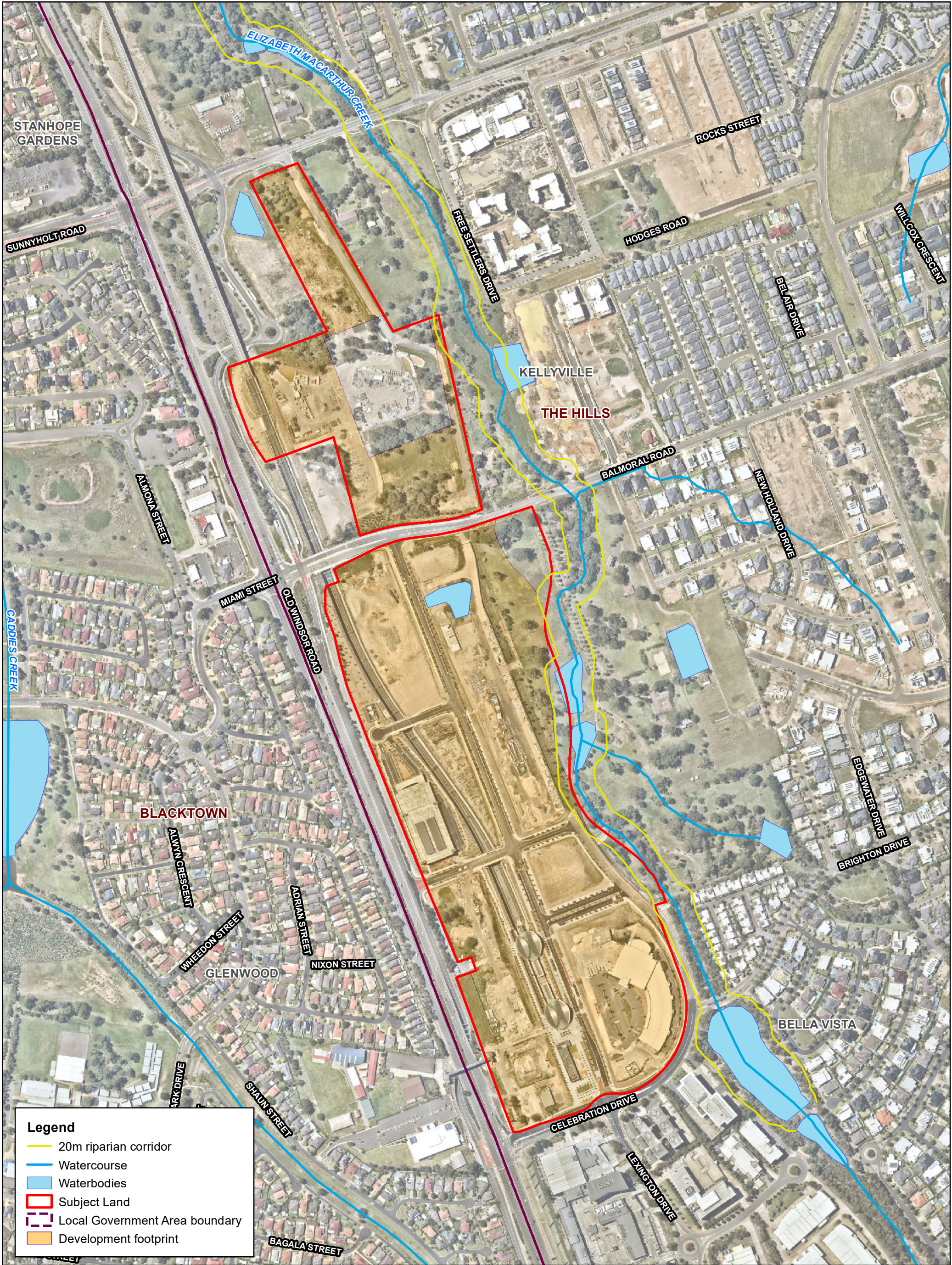
Source: [www.nearmap.com](http://www.nearmap.com) (last accessed 8 August 2018)

Bella Vista Station Precinct in white hatched area with blue dotted line representing the Sydney Metro rail line.











## 2 LEGISLATIVE CONTEXT

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### 2.1 BIODIVERSITY CONSERVATION ACT 2016

The NSW BC Act came into effect on the 25 August 2017. This Act repealed the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

The BC Act outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. The Biodiversity Offsets Scheme (BOS) creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity (Office of Environment and Heritage, 2017).

The Biodiversity Assessment Method (BAM) was established by OEH as a standard method to implement the aims of the BOS and to address the loss of biodiversity and threatened species. The scheme creates a market framework for the conservation of biodiversity values and the offsetting of development impacts. It also provides the mechanisms to offset impacts of development, clearing or biodiversity certification such that there is no loss of biodiversity values.

This BDAR has been prepared in accordance with the BAM and includes prescribed biodiversity matters under the Biodiversity Conservation Regulation 2017.

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### 2.2 FISHERIES MANAGEMENT ACT 1994

The key objects of the *Fisheries Management Act 1994* (FM Act) are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The Act provides for the listing of threatened species, populations and ecological communities, listing of 'Key Threatening Processes', and the requirements or otherwise for the preparation of a Species Impact Statement (SIS).

One of the objectives of the FM Act is to 'conserve key fish habitats' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. To assist in the protection of key fish habitats, the Department of Primary Industries (DPI) has produced the Policy and guidelines for fish habitat conservation and management (DPI 2013). This policy applies to the following developments, works or activities, each of which can impact on key fish habitat:

- Dredging or reclamation
- Impeding fish passage
- Damaging marine vegetation
- De-snagging.

The development footprint will not impact on any watercourse or potential fish habitat such that it would result in dredging or reclamation, impeded fish passage, damage marine vegetation or de-snagging. Springvale drain occurs to the west of Nant Street that runs adjacent to the development footprint and will not be directly impacted upon by the development.

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### 2.3 BIOSECURITY ACT 2015

The *Biosecurity Act 2015* provides for risk-based management of biosecurity in NSW. It provides a statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Priority weeds recorded in the development site and their control measures are detailed in section 5.4.

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## 2.4 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The objective of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on 'Matters of National Environmental Significance' (MNES) undergo an assessment and approval process. Under the EPBC Act, an action includes a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment. MNES relevant to this report include threatened species and ecological communities and migratory species.

The EPBC Act has been considered in this assessment through:

- Desktop review to determine the listed biodiversity matters that are predicted to occur within the locality of the project and hence could occur, subject to the habitats present
- Targeted field surveys for listed threatened biota and migratory species
- Assessment of potential impacts on threatened and migratory biota, including assessments of significance in accordance with the EPBC Act significant impact guidelines (Department of the Environment 2013) where relevant
- Identification of suitable impact mitigation and environmental management measures for threatened and migratory biota, where required.

## 3 METHODS

The following methods have been undertaken in the preparation of this BDAR in accordance with the BAM. All work was carried out under the appropriate licences, including a scientific licence as required under Part 2 of the BC Act (License Number: SL100630) and an Animal Research Authority issued by the DPI (Agriculture).

### 3.1 PERSONNEL

The contributors to the preparation of this report, their qualifications and roles are provided in Table 3.1.

Table 3.1 Contributors and their qualifications

| NAME           | QUALIFICATIONS                                                                                                    | ROLE                                            |
|----------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Alex Cockerill | Bachelor of Science (Hons)<br>Accredited BAM Assessor (BAAS17020)                                                 | Principal Ecologist - Technical review          |
| Mark Stables   | Bachelor of Science (Hons)<br>Accredited BAM Assessor (BAAS18097)                                                 | Principal Ecologist - Field surveys / reporting |
| Julia Emerson  | Bachelor of Environment; Certificate 3<br>Conservation and Land Management<br>Accredited BAM Assessor (BAAS18034) | Ecologist - Field surveys                       |
| Troy Jennings  | Bachelor Biodiversity Conservation<br>Masters of Wildlife Management<br>Accredited BAM Assessor (BAAS18172)       | Ecologist - Field surveys / reporting           |
| Trent Bowman   | Bachelor of Science (Hons); Master of Science in<br>Geoscience                                                    | GIS Consultant – Mapping and data management    |

### 3.2 NOMENCLATURE

Names of vegetation communities used in this report are based on the PCTs used in the NSW BioNet Vegetation Classification Database (Office of Environment & Heritage 2019a).

These names are cross-referenced with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act.

Names of plants used in this document follow PlantNET (Royal Botanic Gardens 2019). Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in the species results provided in Appendix C. The names of introduced species are denoted with an asterisk (\*).

For threatened species of plants, the names used in the OEH Threatened Species Website (Office of Environment & Heritage 2019b) are also provided in Appendix A where these differ from the names used in the PlantNET database.

Names of vertebrate fauna follow the Australian Faunal Directory maintained by the Department of the Environment and Energy (Department of Environment and Energy, 2019a). Common names are used in the report for species of animal.

For threatened species of animals, the names used in the OEH Threatened Species Website and NSW Department Primary Industries (Office of Environment and Heritage, 2019b, Department of Primary Industries, 2019a).

## 3.3 BACKGROUND RESEARCH

Background research was conducted to identify:

- landscape-scale features of the development site in accordance with Section 4.2 of the BAM (Office of Environment & Heritage 2017)
- site context of the development site that includes assessing vegetation cover and patch size as required under Subsections 4.3.2 and 5.3.2 of the BAM (Office of Environment & Heritage 2017).
- the likely distribution of native vegetation and threatened ecological communities, based on previous mapping and aerial photograph interpretation, for targeted field verification as required under Section 5 of the BAM (Office of Environment & Heritage 2017)
- a list of predicted and candidate threatened species and populations of flora and fauna to assess the habitat suitability and threatened biodiversity data collection as required under Section 6 of the BAM (Office of Environment & Heritage 2017)
- baseline information to determine whether additional surveys, mapping and reporting is required to support project approval.

### 3.3.1 DATABASE SEARCHES

The aim of the background research was to identify threatened flora and fauna species, populations and ecological communities, Commonwealth listed Migratory species or critical habitat recorded previously or predicted to occur in the locality of the subject land.

This allowed for known habitat characteristics of to be compared with those present within the subject land to determine the likelihood of occurrence of each species or populations. These results informed the identification of appropriate field survey effort and the groups likely to occur.

Records of threatened species, populations and ecological communities known or predicted to occur in the locality of the subject land were obtained from a range of databases as detailed in Table 3.2.

Table 3.2 Database searches undertaken

| DATABASE                                                         | SEARCH DATE | AREA SEARCHED                                    | REFERENCE                                        |
|------------------------------------------------------------------|-------------|--------------------------------------------------|--------------------------------------------------|
| Bionet Atlas of NSW Wildlife                                     | 18/02/19    | 10 km x 10 km centred on the development site    | (Office of Environment & Heritage 2019c)         |
| Protected Matters Search Tool                                    | 15/02/19    | 10 km x 10 km centred on the development site    | (Department of the Environment and Energy 2019b) |
| PlantNet Spatial Search                                          | 15/02/19    | 5 km radius centred on the suburb of Bella Vista | (Royal Botanic Gardens, 2019)                    |
| NSW Department of Primary Industries Critical Habitat register   | 18/02/19    | Search of the register                           | (Department of Primary Industries 2019b)         |
| NSW Office of Environment and Heritage Critical Habitat register | 18/02/19    | Search of the register                           | (Office of Environment and Heritage 2019d)       |

Other relevant documents, existing broad-scale vegetation mapping, aerial photographs including historic aerial photos and maps reviewed as part of this study are referenced throughout the report where appropriate.



### 3.3.2 SPATIAL DATA USED FOR THE ASSESSMENT OF LANDSCAPE FEATURES

The following spatial data and reports was assessed to determine the landscape features and site values in accordance with Chapter 4 and Appendix 6 of the BAM:

The background research included analysis of the following information sources:

- Aerial photographic imagery (SEED portal) (Office of Environment and Heritage, 2019e)
- NSW Mitchell Landscapes (SEED portal) (Office of Environment and Heritage, 2019e)
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) (Department of Environment & Energy 2016)
- Atlas of Groundwater Dependent Ecosystems (GDE) (Australian Bureau of Meteorology 2019)
- Directory of Important Wetlands of Australia (Department of Environment & Energy 2019c)
- State Environmental Planning Policy (Coastal Management) 2018 – Coastal Wetlands (NSW Department of Planning & Environment, 2018)
- Priority weed listings for the Greater Sydney region (Department of Primary Industries 2019c)
- Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands (Tozer et al. 2010)

### 3.3.3 LIKELIHOOD OF OCCURRENCE ASSESSMENT

An assessment was completed to assess the likelihood of occurrence of each threatened species, population and community (threatened biodiversity) identified with the potential to occur in the subject land. All threatened biodiversity identified during background research were considered (see Table 3.2). The habitat assessment was utilised to inform the identification of appropriate targeted surveys. The assessment was based on the habitat profile for the species and other habitat information in the *Threatened Species Profile Database* (Office of Environment and Heritage, 2019f) and the *Species Profile and Threats Database* (Department of the Environment and Energy, 2019b). The assessment also included consideration of the dates and locations of nearby records and information about species populations in the locality. The assessment results are provided in full in Appendix A and Appendix B.

For this study, the likelihood of occurrence of threatened and migratory species and populations was determined based on the criteria shown in Table 3.3 below.

Table 3.3 Likelihood of occurrence criteria for threatened species and populations

| CLASSIFICATION  | DEFINITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>High</b>     | It is highly likely that a species inhabits the subject land and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowing resources), has been recorded recently within the locality (10 km) and is known or likely to maintain resident populations in the subject land. Also includes known or likely to visit the subject land during regular seasonal movements or migration.                                                                                                       |
| <b>Moderate</b> | Potential habitat is present within the subject land. Species unlikely to maintain sedentary populations, however may seasonally use resources within the subject land opportunistically or during migration. The species is unlikely to be dependant (i.e. for breeding or important life cycle periods such as winter flowing resources) on habitat within the subject land, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded. |
| <b>Low</b>      | It is unlikely that the species inhabits the subject land and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the subject land is widely                                                                                                                                                                                                                                                                                                                                              |

| CLASSIFICATION | DEFINITION                                                                                                                                                                                                                                                                                                                                                    |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | distributed in the local areas, meaning that the species is not dependant (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the subject land or the species are a non-cryptic perennial flora species that were specially targeted by surveys and not recorded. |
| <b>None</b>    | Suitable habitat is absent from subject land                                                                                                                                                                                                                                                                                                                  |

### 3.3.4 IDENTIFICATION OF CANDIDATE SPECIES

Candidate species are those that have been assessed as having a moderate to high likelihood of occurring in the subject land based on desktop assessment and field assessment. Candidate species can form ecosystem credit species or species credit species as defined under the BAM:

- Ecosystem species credits: are a measurement of the value of threatened communities and habitat for those species that can be reliably predicted to occur with a Plant Community Type (PCT).
- Species credits: are generated by those species that were either recorded during field surveys (or recorded during previous surveys) or have been identified as requiring species credit offsets (as per Biodiversity Assessment Methodology).
- Targeted surveys were undertaken for candidate species as outlined in Section 3.4.2.5 & 3.4.3.4 below.

As stated in the BAM Section 6.4.1.17 (Office of Environment & Heritage, 2017), a candidate species credit species will be considered unlikely to occur on the subject land if:

- After carrying out a field assessment of the habitat constraints or microhabitats on the subject land, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land; or
- An expert report that is prepared in accordance with subsection 6.5.2 states that the species is unlikely to be present on the subject land or specific vegetation zones

A candidate species credit species that is not considered to have suitable habitat on the subject land does not require further assessment on the subject land (Office of Environment & Heritage, 2017). A likelihood of occurrence assessment has been undertaken for all identified threatened species in Appendix A and Appendix B

## 3.4 FIELD SURVEY

The subject land was surveyed over three separate days on 5 December 2018, 16 January 2019 and 7 February 2019 by a team of two ecologists. These surveys sought primarily to collect vegetation data and carry out threatened species in accordance with BAM and relevant guidelines to support the BAM Calculator.

### 3.4.1 WEATHER CONDITIONS

Weather condition experienced during the survey period are outlined in Table 3.4. Generally, temperatures were mild to warm and no rainfall was experienced.

Table 3.4 Weather conditions during the survey period

| DATE     | MINIMUM TEMP | MAXIMUM TEMP | RAINFALL (MM) |
|----------|--------------|--------------|---------------|
| 5/12/18  | 17.0°C       | 21.3°C       | 0.0           |
| 17/01/19 | 22.2°C       | 36.2°C       | 0.0           |
| 7/02/19  | 18.5°C       | 31.0°C       | 0.0           |

Source: Bureau of Meteorology All Weather Station 066124 Paramatta North NSW (8.5 km away)

### 3.4.2 VEGETATION SURVEYS

#### 3.4.2.1 STRATIFICATION – DESKTOP ANALYSIS OF VEGETATION

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, dams and power lines), vegetation structure and likely native versus exotic species composition throughout the subject land. This provided an initial definition of vegetation communities into simple structural and disturbance classifications for verification during field surveys.

#### 3.4.2.2 RANDOM MEANDER SURVEY

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by (Cropper, 1993), whereby the recorder walks in a random meander throughout the subject land recording dominant and key plant species (e.g. threatened species, priority weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness. This survey technique was used to verify vegetation boundaries and stratification from the desktop analysis.

#### 3.4.2.3 FIELD VERIFICATION OF VEGETATION MAPPING

Field validation (ground-truthing) of the existing vegetation classifications was completed based on random meander surveys and BAM vegetation integrity plots. Field verification was undertaken to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. Field data was compared and analysed against the regional vegetation mapping key diagnostic species to confirm each vegetation type. Field verification of the vegetation type, class and formation was used to identify vegetation zones and conditions in accordance with the BAM and NSW BioNet Vegetation Classification Database (Office of Environment & Heritage 2019a).

#### 3.4.2.4 BAM VEGETATION INTEGRITY PLOTS

Vegetation integrity plots were undertaken following the Biodiversity Assessment Method (BAM) (Office of Environment and Heritage, 2017) as required under the BC Act.

A total of 8 vegetation integrity plots were undertaken as outlined in the methodology contained within the BAM as described below and illustrated in Figure 3.1. Table 3.5 outlines the co-ordinates, orientations and vegetation type sampled for each plot whilst Table 3.6 compares the areas of each vegetation zone and number of plots completed to the requirements of the BAM.

Table 3.5 Location and orientation of biobank quadrats and transects

| PLOT ID | VEGETATION TYPE & CONDITION                                                                                                     | EASTING | NORTHING | ORIENTATION |
|---------|---------------------------------------------------------------------------------------------------------------------------------|---------|----------|-------------|
| Q1      | PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition)     | 309384  | 6265932  | 140°        |
| Q2      | Unassigned                                                                                                                      | -       | -        | -           |
| Q3      | PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition) | 309200  | 6266582  | 125°        |



| PLOT ID | VEGETATION TYPE & CONDITION                                                                                                                    | EASTING | NORTHING | ORIENTATION |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|-------------|
| Q4      | PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition)                | 309305  | 6266499  | 40°         |
| Q5      | Unassigned                                                                                                                                     | -       | -        | -           |
| Q6      | PCT 1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (Moderate condition)              | 309329  | 6266968  | 290°        |
| Q7      | PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition)                | 309211  | 6266727  | 230°        |
| Q8      | PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition) | 309448  | 6266610  | 320°        |

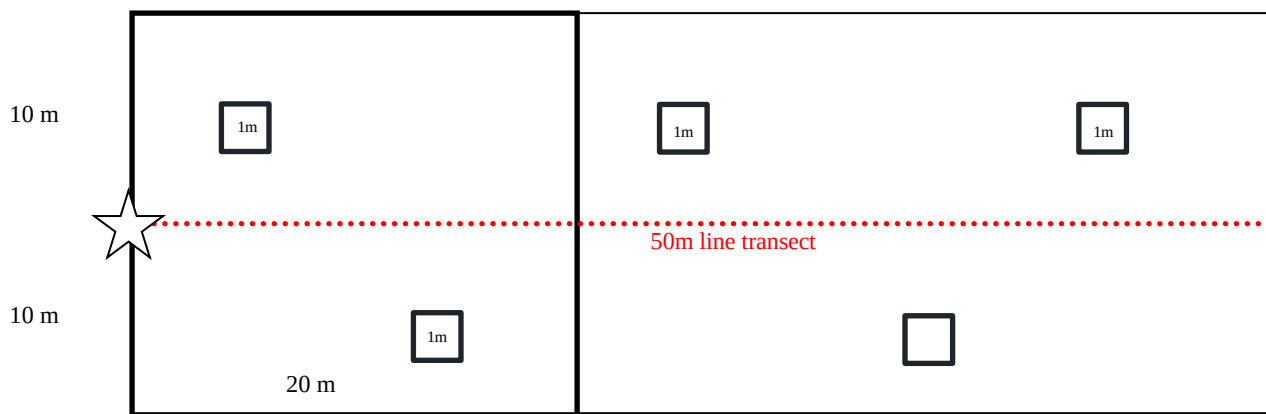


Figure 3.1 Schematic diagram illustrating the layout of the nested 20 x 50 m, 20 x 20 m and 1 x 1 m sub-quadrats used for the assessment of condition attributes at each site

The following site attributes were recorded at each site:

- **Location** (easting – northing grid type MGA 94, Zone 56).
- **Native and exotic species richness** (within a 400 m<sup>2</sup> quadrat): This consisted of recording all species by systematically walking through each 20 x 20 m quadrat. The cover and abundance (percentage of area of quadrat covered) of each species was estimated. The growth form, stratum/layer and whether each species was native/exotic/high threat weed was also recorded.
- **Number of trees with hollows** (1,000 m<sup>2</sup> quadrat): This was the frequency of hollows within living and dead trees within each 50 x 20 m quadrat. A hollow was only recorded if (a) the entrance could be seen: (b) the estimated entrance width was at least 5 cm across: (c) the hollow appeared to have depth: (d) the hollow was at least 1 m above the ground and the (e) the centre of the tree was located within the sampled quadrat.
- **Number of large trees and stem size diversity** (1,000 m<sup>2</sup> quadrat): tree stem size diversity was recorded by measuring the diameter at breast height (DBH) (i.e. 1.3 m from the ground) of living trees (>5 cm DBH) within each 50 x 20 m quadrat. For multi-stemmed living trees, only the largest stem was included in the count. Number of large trees was determined by counting all trees with DBH greater than the DBH large trees for each vegetation formation.

- **Evaluation of regeneration:** This was estimated as the presence/absence of overstorey species present at the site that was regenerating (i.e. saplings with a diameter at breast height  $\leq 5$  cm).
- **Total length of fallen logs** (1,000 m<sup>2</sup> quadrat): This was the cumulative total of logs within each 50 x 20 m quadrat with a diameter of at least 10 cm and a length of at least 0.5 m.
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter  $< 10$  cm which is detached from a living plant) from within five 1 x 1 m sub-plots spaced evenly either side of the 50 m central transect.

Table 3.6 Minimum number of transects/plots required per vegetation zone area

| ZONE ID | VEGETATION TYPE & ZONE                                                                                                                         | AREA WITHIN SUBJECT LAND | MINIMUM PLOTS REQUIRED | NUMBER PLOTS COMPLETED |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------|------------------------|
| VZ1     | PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition) | 0.33                     | 1                      | 1<br>(Q8)              |
| VZ2     | PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition)                | 1.54                     | 1                      | 3<br>(Q3, Q4, Q7)      |
| VZ3     | PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition)                    | 1.26                     | 1                      | 1<br>(Q1)              |
| VZ4     | PCT 1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (Moderate condition)              | 0.01                     | 1                      | 1<br>(Q6)              |

#### 3.4.2.5 CANDIDATE THREATENED FLORA SPECIES AND SURVEY EFFORT

A total of five threatened flora species were identified as having a moderate or higher likelihood of occurrence that became candidate species and were the focus of detailed targeted surveys (Appendix A). A summary of survey effort for each candidate threatened flora species is outlined in Table 3.7.

Table 3.7 Summary of targeted candidate threatened flora survey effort

| SCIENTIFIC NAME                                         | COMMON NAME              | BC ACT STATUS <sup>1</sup> | OPTIMUM SURVEY PERIOD | VEGETATION TYPE   | SURVEY EFFORT IN SUBJECT LAND                      |
|---------------------------------------------------------|--------------------------|----------------------------|-----------------------|-------------------|----------------------------------------------------|
| <i>Acacia pubescens</i>                                 | Downy Wattle             | V                          | Detectable all year   | PCT 835 & PCT 849 | 5 December 2018, 16 January 2019 & 7 February 2019 |
| <i>Grevillea juniperina</i> subsp. <i>juniperina</i>    | Juniper-leaved Grevillea | V                          |                       |                   |                                                    |
| <i>Pimelea curviflora</i> var. <i>curviflora</i>        | -                        | V                          | Detectable all year   |                   | 5 December 2018, 16 January 2019 & 7 February 2019 |
| <i>Pimelea spicata</i>                                  | Spiked Rice-flower       | E                          |                       |                   |                                                    |
| <i>Wahlenbergia multicaulis</i> - endangered population | Tadgell's Bluebell       | E                          |                       |                   |                                                    |

(1) Listed under the BC Act - E= Endangered, V= Vulnerable

### 3.4.3 FAUNA SURVEY

This section outlines the fauna survey effort completed for candidate species which were predicted to have a moderate to high likelihood of occurrence within the subject land based on database searches outlined in section 3.3. Threatened fauna surveys completed within the subject land were carried out as described below and where applicable, considering the methodology detailed in the NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004), the Survey Guidelines for Australia's Threatened Birds (Department of Environment Water Heritage and the Arts, 2010), the Threatened Species survey and assessment guidelines: field survey and methods for fauna-Amphibians (Department of Environment and Climate Change, 2009) and the Survey guidelines for Australia's threatened frogs (Department of the Environment Water Heritage and the Arts, 2010). Targeted fauna surveys for threatened species were undertaken during November 2017. Survey methods are described below.

#### 3.4.3.1 FAUNA HABITAT ASSESSMENT

Fauna habitat assessments were undertaken to assess the likelihood of threatened species of animal (those species known or predicted to occur within the locality from the literature and database review) occurring within the subject land. Fauna habitat assessments were the primary assessment tool in assessing whether threatened species is likely to occur within the subject land. Fauna habitat characteristics assessed included:

- Structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources.
- Presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles.
- Presence of the ground cover vegetation, leaf litter, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians.
- Presence of waterways (ephemeral or permanent) and water bodies.

The following criteria were used to evaluate the condition of habitat values:

- **Good:** A full range of fauna habitat components are usually present (for example, old-growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact.
- **Moderate:** Some fauna habitat components are missing or greatly reduced (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded.
- **Poor:** Many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing in the past.

#### 3.4.3.2 OPPORTUNISTIC RECORDING OF FAUNA SPECIES AND EVIDENCE OF FAUNA ACTIVITY

Opportunistic sightings of animals were recorded during field surveys. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc., was also noted. This provided indirect information on animal presence and activity.

During these surveys, a hand-held GPS was used to record the locations of:

- Hollow-bearing trees
- Aquatic habitat
- Rock outcrops.



### 3.4.3.3 ACTIVE INVERTEBRATE SEARCHES

Active invertebrate searches involve diurnal hand searches (i.e. disturbance of habitat) and visual searches targeting specific habitat. In relation to threatened invertebrate species (i.e. Cumberland Plain Land Snail) specific habitat preferences include under logs and other debris, amongst leaf litter and bark accumulations around bases of trees and sometimes in clumps of grass. Invertebrates are also known to shelter under rubbish, disposed building materials and abandoned car parts (National Parks and Wildlife Service, 2000).

### 3.4.3.4 CANDIDATE THREATENED FAUNA SPECIES AND SURVEY EFFORT

The BAM Calculator identified 13 candidate threatened fauna species that may occur on site. Of these, 10 are not considered to be candidate species as the subject land did not provide habitat or microhabitats that these species depend on and as such did not require targeted surveys to be undertaken (Table 3.8).

Table 3.8 Candidate species identified to not occur on site

| SCIENTIFIC NAME                            | COMMON NAME                | BC ACT STATUS <sup>1</sup> | HABITAT/BREEDING FEATURES                                                                                                           | JUSTIFICATION                                                                                                                                                                                                   |
|--------------------------------------------|----------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Anthochaera phrygia</i>                 | Regent Honeyeater          | CE                         | As per mapped areas                                                                                                                 | Subject land provides generally unsuitable habitat. Subject land not within important mapped areas where breeding is known to occur.                                                                            |
| <i>Haliaeetus leucogaster</i>              | White-bellied Sea-eagle    | V                          | Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines | Preferred coastal habitat not recorded within the subject land. No breeding habitat in the form of living or dead mature trees within suitable vegetation near open waterbodies of sufficient size are present. |
| <i>Lathamus discolor</i>                   | Swift Parrot               | E                          | Mapped important areas and breeding areas                                                                                           | Species may utilise the subject land for foraging during seasonal blossom occurrences. Subject land outside where breeding occurs in Tasmania.                                                                  |
| <i>Litoria aurea</i>                       | Green and Golden Bell Frog | E                          | Semi-permanent/ephemeral wet areas, swamps and waterbodies                                                                          | Marginal suitable habitat recorded within the subject land. No recent records within locality of the subject land.                                                                                              |
| <i>Miniopterus australis</i>               | Little Bentwing Bat        | V                          | Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding                                           | No breeding habitat (i.e. caves, artificial culverts etc.) within the subject lands.                                                                                                                            |
| <i>Miniopterus schreibersii oceanensis</i> | Eastern Bentwing Bat       | V                          | Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding                                           | No breeding habitat (i.e. caves, artificial culverts etc.) within the subject lands.                                                                                                                            |
| <i>Pandion cristatus</i>                   | Eastern Osprey             | V                          | Living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting.                                      | Preferred habitat such as estuaries, bays, inlets and islands not recorded within the subject land nor presence of breeding habitat (living and dead trees near waterbodies).                                   |

| SCIENTIFIC NAME               | COMMON NAME            | BC ACT STATUS <sup>1</sup> | HABITAT/BREEDING FEATURES                                                                                                                                                              | JUSTIFICATION                                                                                                                                                                                                                                      |
|-------------------------------|------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Petaurus norfolcensis</i>  | Squirrel Glider        | V                          | Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart). | Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation. Limited presence of large old trees that are well connected to extensive patches of vegetation. |
| <i>Phascolarctos cinereus</i> | Koala                  | V                          | Mapped important habitat – as determined by OEH                                                                                                                                        | Not within mapped important habitat. Though preferred feed tree species <i>Eucalyptus tereticornis</i> was recorded, the subject land has limited connectivity to larger patches of remnant vegetation and is unlikely to support the Koala.       |
| <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox | V                          | Breeding camps                                                                                                                                                                         | No breeding camps recorded or identified within subject lands. Species may utilise the vegetation for foraging habitat as part of their broader home range.                                                                                        |

(1) Listed under the BC Act – CE= Critically Endangered, E= Endangered, V= Vulnerable

A total of three threatened fauna species were identified as having a moderate or higher likelihood of occurrence that became candidate species and were the focus of detailed targeted surveys (Appendix B). A summary of survey effort for each candidate threatened flora species is outlined in Table 3.9.

Table 3.9 Summary of targeted candidate threatened fauna survey effort

| SCIENTIFIC NAME               | COMMON NAME                 | BC ACT STATUS <sup>1</sup> | OPTIMUM SURVEY PERIOD | HABITAT FEATURES                                                                                                                                                                                                                                            | SURVEY EFFORT IN SUBJECT LAND                                        |
|-------------------------------|-----------------------------|----------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| <i>Meridolum corneovirens</i> | Cumberland Plain Land Snail | E                          | All year              | N/A                                                                                                                                                                                                                                                         | Active searches – 5 December 2018, 16 January 2019 & 7 February 2019 |
| <i>Pommerhelix duralensis</i> | Dural Woodland Snail        | E                          | All year              | <ul style="list-style-type: none"> <li>— Leaf litter and shed bark or within 50m of litter or bark.</li> <li>— Rocky areas / rocks or within 50m of rocks.</li> <li>— Fallen timber/logs - including logs and bark or within 50m of logs or bark</li> </ul> | Active searches – 5 December 2018, 16 January 2019 & 7 February 2019 |
| <i>Myotis macropus</i>        | Southern Myotis             | V                          | October - March       | <ul style="list-style-type: none"> <li>— Hollow-bearing trees within 200 m of riparian zone</li> </ul>                                                                                                                                                      | No survey effort due to site access restrictions – Assumed present   |

(1) Listed under the BC Act - E= Endangered, V= Vulnerable

## 4 LANDSCAPE CONTEXT

### 4.1 LANDSCAPE FEATURES

The development site is in the Sydney Basin IBRA bioregion and occurs within the SYB07 Pittwater IBRA subregion (IBRA version 7.0). Landscape features within the development site as prescribed in Section 4 of the BAM are summarised in Table 4.1 and shown in Figure 4.1.

Table 4.1 Landscape feature associated with the development site

| LANDSCAPE FEATURE                                         | DEVELOPMENT SITE                                                                                                    |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| IBRA bioregions and subregions                            | Sydney Basin Bioregion / SYB08 Cumberland subregion                                                                 |
| NSW landscape regions (Mitchell landscapes)               | Cumberland – Cumberland Plain                                                                                       |
| Local Government Area (LGA)                               | Hills Shire Council                                                                                                 |
| Rivers and streams                                        | Elizabeth Macarthur Creek                                                                                           |
| Important and local wetlands                              | No important or local wetlands occur within the development site                                                    |
| Connectivity features                                     | Some connectivity exists in riparian areas, particularly to the north. Overall, connectivity is considered limited. |
| Areas of geological significance and soil hazard features | No areas of geological significance and soil hazard features were recorded                                          |
| Areas of outstanding biodiversity value                   | No declared areas of outstanding biodiversity value occur in or near the subject land                               |

#### 4.1.1 RIVERS AND STREAMS

Elizabeth Macarthur Creek is a 2<sup>nd</sup> order waterway under the Strahler stream ordering system and as such the riparian buffer distance is 20 metres on each side of the waterway from the top of bank.

### 4.2 DETERMINING SITE CONTEXT

To determine site context as required under Section 4.3 of the BAM, an assessment of site-based native vegetation cover and patch size in accordance with Subsections 4.3.2 and 5.3.2 of the BAM have been undertaken and are outlined below.

#### 4.2.1 NATIVE VEGETATION COVER

Native vegetation cover within the development site and a 1500-metre buffer area surrounding the outside edge of the boundary of the development site was determined in accordance with Subsection 4.2.1.2 of the BAM and is summarised in Table 4.2 and shown in Figure 4.2.

Table 4.2 Native vegetation cover

| ASSESSMENT AREA | TOTAL ASSESSMENT AREA (HA) | AREA OF NATIVE VEGETATION COVER (HA) | NATIVE VEGETATION PERCENTAGE COVER |
|-----------------|----------------------------|--------------------------------------|------------------------------------|
| 1500m buffer    | 1287.81                    | 51.25                                | 3.98 %                             |



#### 4.2.2 PATCH SIZE

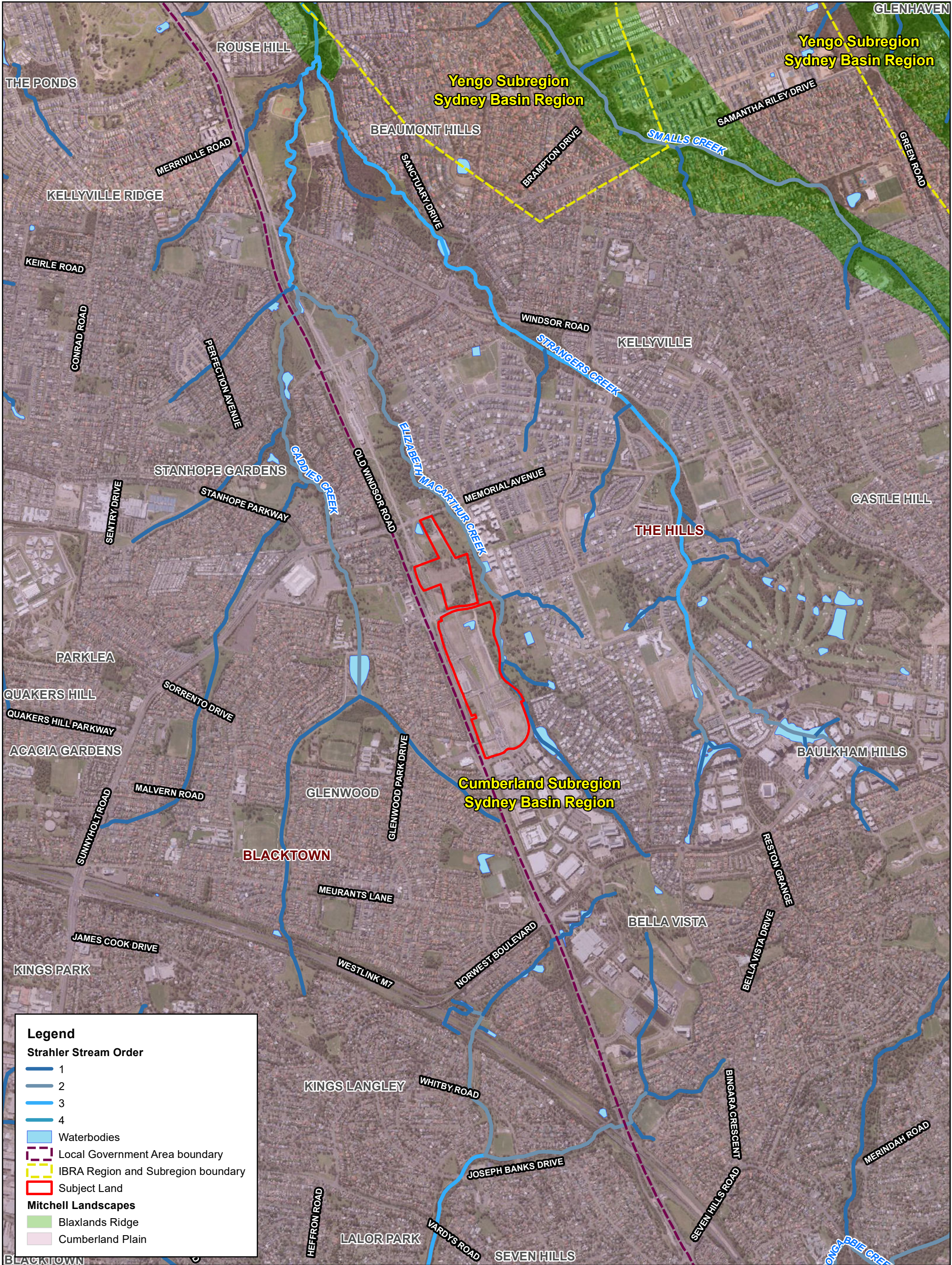
Patch size is defined under the BAM (Office of Environment & Heritage, 2017) as an area of native vegetation that:

- occurs on the development site or stewardship site, and
- includes native vegetation that has a gap of less than 100 m from the next area of moderate to good native vegetation (or  $\leq 30$  m for non-woody ecosystems).

Patch size may extend onto adjoining land that is not part of the development site.

Patch size area is assigned to each vegetation zone as a class, being  $< 5$  ha, 5-24 ha, 25-100 ha or  $\geq 100$  ha. Due to the highly disturbed and fragmented landscape, patch size for each native vegetation zone has been determined to be  $< 5$  ha.









Legend

Watercourse

Subject Land

Waterbodies

Landscape Assessment Area (1500 m buffer)

Local Government Area boundary

Native Vegetation (Tozer et al, 2010)



# 5 VEGETATION TYPES AND THREATENED ECOLOGICAL COMMUNITIES

The section has been prepared to address section 5 of the BAM. Specifically, this section maps and identifies all native and non-native vegetation types within the site and provides an assessment of vegetation integrity and whether any recorded vegetation types correspond to threatened ecological communities listed under the BC Act.

---

## 5.1 OVERVIEW

Three native vegetation PCTs were recorded in the subject land. These are:

- PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial 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
- PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion

In addition, three non-native vegetation types were assigned to a miscellaneous ecosystem class, being:

- Miscellaneous ecosystem – highly disturbed areas with no or limited native vegetation
- Miscellaneous ecosystem – urban exotic / native landscape plantings
- Miscellaneous ecosystem – water bodies

These three native vegetation types were assigned to five discrete vegetation zones based on broad condition state criteria as outlined in section 3.2.3. A summary of PCTs and associated vegetation zones along with non-native vegetation types are presented in Table 5.1. The extent and distribution of each vegetation type and zone is shown in Figure 5.1 with BAM vegetation integrity plot data presented in Appendix C.

Detailed descriptions and selection justification for each PCT and vegetation zone is provided in section 5.2 below. A summary and description of non-native vegetation types is presented in section 5.3.

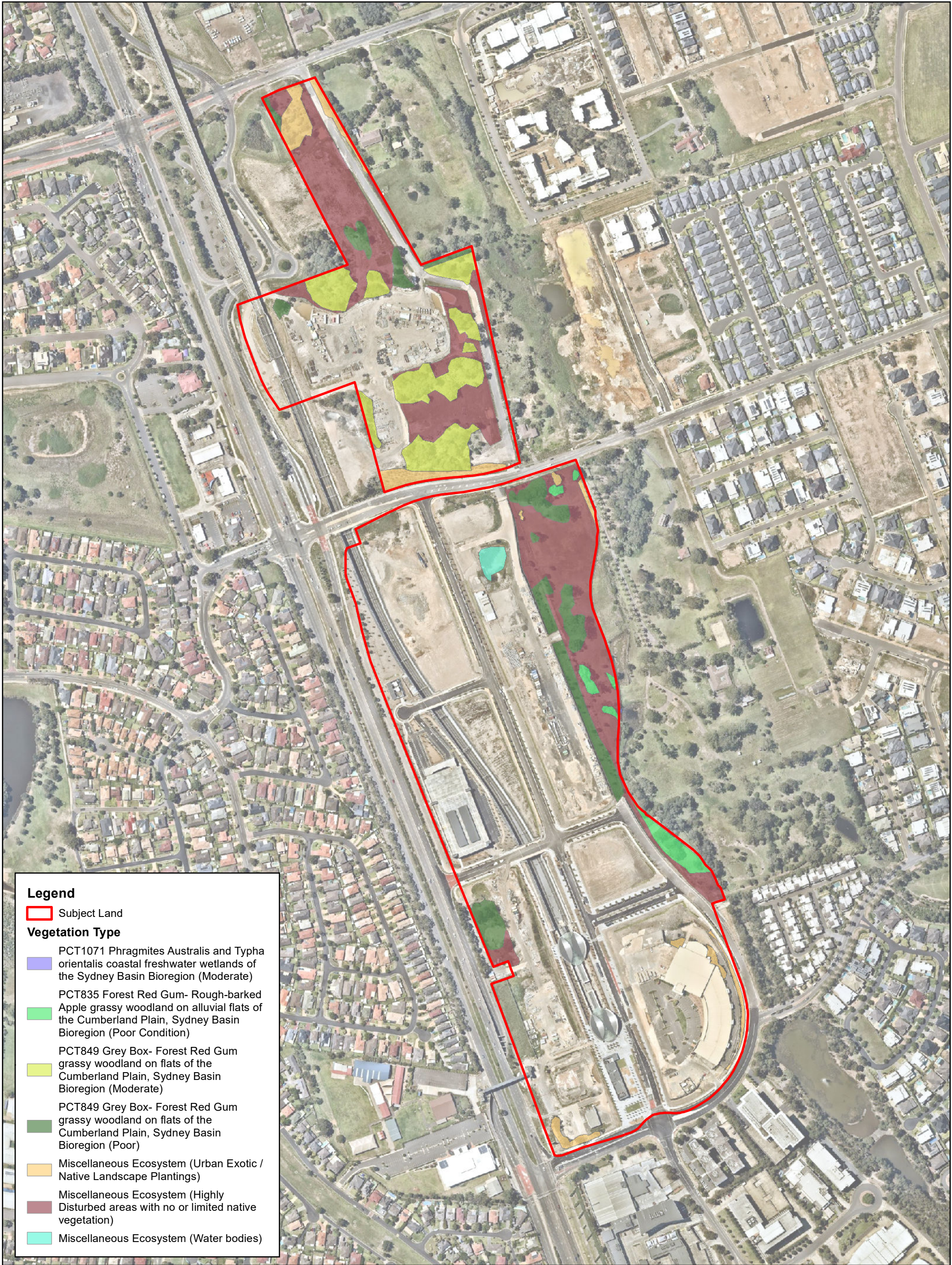


Table 5.1 Overview of native and non-native vegetation types and zones identified within the subject land

| VEGETATION TYPE                                                                                                               | VEGETATION ZONE (VZ) | THREATENED ECOLOGICAL COMMUNITY                                                                                              | VEGETATION FORMATION | VEGETATION CLASS                | IBRA REGION / SUBREGION                   | PCT % CLEARED | PATCH SIZE (HA) | VEGETATION INTEGRITY SCORE | EXTENT (HA) |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|-------------------------------------------|---------------|-----------------|----------------------------|-------------|
| Native vegetation                                                                                                             |                      |                                                                                                                              |                      |                                 |                                           |               |                 |                            |             |
| PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion | VZ1 - Poor           | River-flat Eucalypt Forest on Coastal Floodplain - Endangered BC Act                                                         | Forested Wetlands    | Coastal Floodplain Wetlands     | Sydney Basin / SYB08 Cumberland subregion | 93            | 5-24            | 48.1                       | 0.33        |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion                    | VZ2 - Moderate       | Cumberland Woodland in the Sydney Basin Bioregion – Critically Endangered BC Act                                             | Grassy Woodlands     | Coastal Valley Grassy Woodlands |                                           | 93            | 5-24            | 67.9                       | 1.54        |
|                                                                                                                               | VZ3 - Poor           |                                                                                                                              |                      |                                 |                                           |               | <5              | 31.5                       | 1.26        |
| PCT 1071 <i>Phragmites australis</i> and <i>Typha orientalis</i> coastal freshwater wetlands of the Sydney Basin Bioregion    | VZ4 - Moderate       | Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | Freshwater Wetlands  | Coastal Freshwater Lagoons      |                                           | 75            | <5              | 47.1                       | 0.01        |
| Total native vegetation                                                                                                       |                      |                                                                                                                              |                      |                                 |                                           |               |                 |                            | 3.13        |
| Non-native vegetation                                                                                                         |                      |                                                                                                                              |                      |                                 |                                           |               |                 |                            |             |
| Miscellaneous ecosystem – highly disturbed areas with no or limited native vegetation                                         | VZ5                  | -                                                                                                                            | -                    | -                               | -                                         | -             | -               | -                          | 4.66        |
| Miscellaneous ecosystem – urban exotic / native landscape plantings                                                           | VZ6                  | -                                                                                                                            | -                    | -                               | -                                         | -             | -               | -                          | 0.81        |

| VEGETATION TYPE                        | VEGETATION ZONE (VZ) | THREATENED ECOLOGICAL COMMUNITY | VEGETATION FORMATION | VEGETATION CLASS | IBRA REGION / SUBREGION | PCT % CLEARED | PATCH SIZE (HA) | VEGETATION INTEGRITY SCORE | EXTENT (HA) |
|----------------------------------------|----------------------|---------------------------------|----------------------|------------------|-------------------------|---------------|-----------------|----------------------------|-------------|
| Miscellaneous ecosystem – water bodies | VZ7                  | -                               | -                    | -                | -                       | -             | -               | -                          | 0.11        |
| Total non-native vegetation            |                      |                                 |                      |                  |                         |               |                 |                            | 5.58        |
| Total all vegetation types             |                      |                                 |                      |                  |                         |               |                 |                            | 8.72        |





**Legend**

Subject Land

**Vegetation Type**

- PCT1071 Phragmites Australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (Moderate)
- PCT835 Forest Red Gum- Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Poor Condition)
- PCT849 Grey Box- Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate)
- PCT849 Grey Box- Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Poor)
- Miscellaneous Ecosystem (Urban Exotic / Native Landscape Plantings)
- Miscellaneous Ecosystem (Highly Disturbed areas with no or limited native vegetation)
- Miscellaneous Ecosystem (Water bodies)

Map: BellaVista\_GIS\_012\_A2

Author: T.Bowman

Date: 7/10/2020

Approved by: M.S

Data source:



0 100 200  
1:4,492

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3



Landcom

**Bella Vista Station Precinct**

**Figure 5.1**  
Vegetation types and zones

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## 5.2 NATIVE VEGETATION

A description of recorded attributes for each native vegetation PCT are provided below.

### 5.2.1 PCT 835 FOREST RED GUM - ROUGH-BARKED APPLE GRASSY WOODLAND ON ALLUVIAL FLATS OF THE CUMBERLAND PLAIN, SYDNEY BASIN BIOREGION

The occurrence of this vegetation type within the development site is illustrated in Figure 5.1 with photographic representation provided in Photo 5.1 and Photo 5.2. A profile of PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion is provided in Table 5.2 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.3.

Table 5.2 Summary of PCT 835 - Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion

| <b>PCT 835 FOREST RED GUM - ROUGH-BARKED APPLE GRASSY WOODLAND ON ALLUVIAL FLATS OF THE CUMBERLAND PLAIN, SYDNEY BASIN BIOREGION</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCT Justification                                                                                                                    | <p>The canopy stratum is dominated by the three PCT 835 diagnostic species <i>Angophora floribunda</i> (Rough-barked Apple), <i>Eucalyptus amplifolia</i> subsp. <i>amplifolia</i> (Cabbage Gum) and <i>Eucalyptus tereticornis</i> (Forest Red Gum).</p> <p>Parts of the development site where this community occurs is located on alluvial flats of the Cumberland Plain associated with Elizabeth Macarthur Creek.</p> <p>A quantitative analysis was undertaken for Q8 using the BioNet Vegetation Classification Community Tool (Office of Environment and Heritage 2019a). The IBRA region, dominant canopy and midstorey species were used as search criteria. PCT 835 and PCT 1800 had a total of five matches and were considered further. PCT 1800 Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley was dismissed due to the absence of <i>Casuarina glauca</i> (Swamp Oak) in the upper stratum.</p> <p>Based on floristic, geographic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for 835 - Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Office of Environment and Heritage 2019a).</p> |
| Vegetation formation                                                                                                                 | Forested Wetlands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Vegetation class                                                                                                                     | Coastal Floodplain Wetlands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Vegetation zone                                                                                                                      | VZ1 – Poor condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Conservation status                                                                                                                  | This vegetation type forms part of the River-flat Eucalypt Forest on Coastal Floodplain on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions which is listed as Endangered under the BC Act.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| SAII entity                                                                                                                          | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Percent cleared                                                                                                                      | 93%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Patch size class                                                                                                                     | 5-24 hectares                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Area within the subject land                                                                                                         | Poor condition – 0.33 ha                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| PCT 835 FOREST RED GUM - ROUGH-BARKED APPLE GRASSY WOODLAND ON ALLUVIAL FLATS OF THE CUMBERLAND PLAIN, SYDNEY BASIN BIOREGION |                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Area within the development site                                                                                              | Poor condition – 0.02 ha                                                                                                                                                                                                                                                                                                                                                       |
| Vegetation integrity plots                                                                                                    | Poor condition – Q8                                                                                                                                                                                                                                                                                                                                                            |
| Current vegetation integrity score                                                                                            | Composition condition score: 48.9<br>Structure condition score: 27.5<br>Function condition score: 82.5<br>Current vegetation integrity score: 48.1                                                                                                                                                                                                                             |
| Landscape position                                                                                                            | Occurs on alluvial flats of the Cumberland Plain associated with Elizabeth Macarthur Creek.                                                                                                                                                                                                                                                                                    |
| Dominant canopy species                                                                                                       | <i>Angophora floribunda</i> (Rough-barked Apple), <i>Eucalyptus amplifolia</i> subsp. <i>amplifolia</i> (Cabbage Gum) and <i>Eucalyptus tereticornis</i> (Forest Red Gum)                                                                                                                                                                                                      |
| Characteristic mid-storey species                                                                                             | <i>Acacia decurrens</i> (Sydney green wattle), <i>Bursaria spinosa</i> subsp. <i>spinosa</i> (Native Blackthorn), <i>Chrysanthemoides monilifera</i> ssp. <i>monilifera</i> (Boneseed), <i>Rubus fruticosus</i> agg.* (Blackberry)                                                                                                                                             |
| Characteristic ground cover species                                                                                           | <i>Brunoniella australis</i> (Blue Trumpet), <i>Centella asiatica</i> (Indian Pennywort), <i>Commelina cyanea</i> (Scurvy Weed), <i>Einadia hastata</i> (Berry Saltbush), <i>Glycine tabacina</i> , <i>Microlaena stipoides</i> var. <i>stipoides</i> (Weeping Rice Grass), <i>Paspalidium distans</i> (Spreading Panicgrass), <i>Solanum prinophyllum</i> (Forest Nightshade) |
| Vegetation condition                                                                                                          | Poor condition – the upper stratum has been modified and was mostly dominated by <i>Angophora floribunda</i> (Rough-barked Apple). The middle and ground stratums have been highly modified and exotic species cover was recorded at 79.2 with high threat weed cover at 48.2.                                                                                                 |



Photo 5.1

PCT 835\_adjacent to Elizabeth Macarthur Creek



Photo 5.2

PCT835\_Poor patch (Q8)



Table 5.3 Comparison of PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion plot data against community condition benchmarks

| PLOT            | TREE RICHNESS | SHRUB RICHNESS | GRASS RICHNESS | FORB RICHNESS | FERN RICHNESS | OTHER RICHNESS | TREE COVER | SHRUB COVER | GRASS COVER | FORB COVER | FERN COVER | OTHER COVER | FALLEN LOGS | LITTER COVER | LARGE TREES | CONDITION |
|-----------------|---------------|----------------|----------------|---------------|---------------|----------------|------------|-------------|-------------|------------|------------|-------------|-------------|--------------|-------------|-----------|
| BM <sup>1</sup> | 4             | 8              | 8              | 7             | 2             | 3              | 21         | 21          | 73          | 3          | 1          | 1           | 12          | 40           | 1/50+       | Benchmark |
| Q8              | 1             | 0              | 10             | 5             | 0             | 1              | 18         | 0           | 17.5        | 2.7        | 0          | 0.1         | 5           | 20           | 2(50+)      | Poor      |

- (1) Benchmark data for equivalent community in Sydney Basin IBRA bioregion (Vegetation Type: PCT 835 - Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion quadrat against community condition benchmarks: Vegetation Formation: Forested Wetlands: Vegetation Class: Coastal Floodplain Wetlands: source (Office of Environment & Heritage 2019a).

## 5.2.2 PCT 849 GREY BOX - FOREST RED GUM GRASSY WOODLAND ON FLATS OF THE CUMBERLAND PLAIN, SYDNEY BASIN BIOREGION

The occurrence of this vegetation type within the development site is illustrated in Figure 5.1 with photographic representation provided in Photo 5.3 and Photo 5.4. A profile of PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion is provided in Table 5.4 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.5.

Table 5.4 Summary of PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

| <b>PCT 849 GREY BOX - FOREST RED GUM GRASSY WOODLAND ON FLATS OF THE CUMBERLAND PLAIN, SYDNEY BASIN BIOREGION</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCT Justification                                                                                                 | <p>The canopy stratum is dominated by the two PCT 849 diagnostic species <i>Eucalyptus tereticornis</i> (Forest Red Gum) and <i>Eucalyptus moluccana</i> (Grey Box).</p> <p>The subject land is located on low slopes of the Cumberland Plain.</p> <p>A quantitative analysis was undertaken for Q1, Q3, Q4 and Q7 using the BioNet Vegetation Classification Community Tool (Office of Environment and Heritage 2019a). The IBRA region, dominant canopy and groundcover species were used as search criteria. PCT 849 and PCT 850 each had 8 matches.</p> <p>A further floristic analysis of positive diagnostics species for PCT 849 reference community (GW_p29, Tozer et. al. 2010) was undertaken and identifies that, of the 16-native species recorded from Q1 (excluding <i>Grevillea robusta</i> that is not locally recorded in Sydney), the ratio of positive diagnostic species verse total native species is 75%. Other closely related PCTs 850 and 724 recorded ratios of 50% and 65% respectively.</p> <p>Based on floristic, geographic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 849 within BioNet Vegetation Classification (Office of Environment and Heritage, 2019a).</p> |
| Vegetation formation                                                                                              | Grassy Woodlands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Vegetation class                                                                                                  | Coastal Valley Grassy Woodlands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Vegetation zone                                                                                                   | <p>VZ3 – Moderate condition</p> <p>VZ4 – Poor condition</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Conservation status                                                                                               | <p>This vegetation type forms part of Cumberland Plain Woodland in the Sydney Basin Bioregion which is listed as Critically Endangered under the BC Act.</p> <p>Patches of this vegetation type also form part of the Commonwealth listing of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest that is Critically Endangered under the EPBC Act.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| SAII entity                                                                                                       | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Percent cleared                                                                                                   | 93%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Patch size class                                                                                                  | <5 hectares                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Area within the subject land                                                                                      | Moderate condition – 1.54 hectares; Poor condition – 1.26 hectares                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



| PCT 849 GREY BOX - FOREST RED GUM GRASSY WOODLAND ON FLATS OF THE CUMBERLAND PLAIN, SYDNEY BASIN BIOREGION |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Area within the development footprint                                                                      | Moderate condition – 0.75 hectares; Poor condition – 1.04 hectares                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                       |
| Vegetation integrity plots                                                                                 | Moderate condition – Q3, Q4, Q7; Poor condition – Q1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                       |
| Current vegetation integrity score                                                                         | Moderate condition:<br>Composition condition score: 62.8<br>Structure condition score: 57.5<br>Function condition score: 86.6<br>Current vegetation integrity score: 67.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Poor condition:<br>Composition condition score: 17.5<br>Structure condition score: 27.1<br>Function condition score: 66.1<br>Current vegetation integrity score: 31.5 |
| Landscape position                                                                                         | Occurs on gently undulating low slopes throughout the higher parts of the subject land.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                       |
| Species upper stratum                                                                                      | This vegetation type was mostly dominated by <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark) with scattered occurrence of <i>Eucalyptus moluccana</i> (Grey Box) and <i>Eucalyptus tereticornis</i> (Forest Red Gum)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                       |
| Species middle stratum                                                                                     | The middle stratum was mostly absent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                       |
| Species ground stratum                                                                                     | <i>Aristida vagans</i> (Threeawn Speargrass), <i>Cenchrus clandestinus</i> * (Kikuyu Grass), <i>Dichondra repens</i> (Kidney Weed), <i>Einadia hastata</i> (Berry Saltbush), <i>Microlaena stipoides</i> var. <i>stipoides</i> (Weeping Rice Grass), <i>Oxalis perennans</i> , <i>Rytidosperma caespitosum</i> (Ringed Wallaby Grass), <i>Sida rhombifolia</i> * (Paddys Lucerne), <i>Sporobolus creber</i> (Slender Rat's Tail Grass), <i>Themeda triandra</i> (Kangaroo Grass)                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                       |
| Vegetation condition                                                                                       | Moderate condition – this broad vegetation state exhibited a relatively intact native ground stratum with a weed cover of about 5 - 40 % although high threat weeds were generally <10% in cover. The middle stratum was mostly absent and the upper stratum generally lacked species richness and was mostly dominated by <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark)<br><br>Poor condition – patches were mostly small with the middle and ground strata highly modified with exotic weed cover including <i>Cenchrus clandestinus</i> * (Kikuyu Grass), <i>Eragrostis curvula</i> * (African Love Grass), <i>Panicum maximum</i> * (Guinea Grass), <i>Paspalum dilatatum</i> * (Paspalum), <i>Setaria parviflora</i> * (Slender Pigeon Grass), <i>Sida rhombifolia</i> * (Paddys Lucerne) |                                                                                                                                                                       |



Photo 5.3 PCT 849\_Moderate condition patch



Photo 5.4 PCT 849\_Poor condition patch



Table 5.5 Comparison of PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion plot data against community condition benchmarks

| PLOT            | TREE RICHNESS | SHRUB RICHNESS | GRASS RICHNESS | FORB RICHNESS | FERN RICHNESS | OTHER RICHNESS | TREE COVER | SHRUB COVER | GRASS COVER | FORB COVER | FERN COVER | OTHER COVER | FALLEN LOGS | LITTER COVER | LARGE TREES | CONDITION |
|-----------------|---------------|----------------|----------------|---------------|---------------|----------------|------------|-------------|-------------|------------|------------|-------------|-------------|--------------|-------------|-----------|
| BM <sup>1</sup> | 5             | 8              | 12             | 15            | 2             | 5              | 52         | 18          | 61          | 10         | 1          | 5           | 40          | 35           | 3/50+       | Benchmark |
| Q1              | 1             | 2              | 4              | 3             | 0             | 2              | 30         | 4           | 2.9         | 0.4        | 0          | 0.5         | 0           | 9            | 3(50+)      | Poor      |
| Q3              | 1             | 1              | 12             | 12            | 0             | 3              | 35         | 0.3         | 41.7        | 9          | 0          | 3.2         | 3           | 22           | 4(50+)      | Moderate  |
| Q4              | 2             | 0              | 14             | 12            | 1             | 3              | 35.4       | 0           | 25.4        | 16.4       | 0.5        | 2.5         | 13          | 60           | 4(50+)      | Moderate  |
| Q7              | 1             | 0              | 12             | 8             | 0             | 2              | 24         | 0           | 18.8        | 19.5       | 0          | 0.8         | 5           | 30           | 2(50+)      | Moderate  |

- (1) Benchmark data for equivalent community in Sydney Basin IBRA bioregion (Vegetation Type: PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion quadrat against community condition benchmarks: Keith Formation: KF\_CH3 Grassy Woodland: Keith Class: Coastal Valley Grassy Woodlands: source (Office of Environment & Heritage 2019a).

### 5.2.3 PCT 1071 PHRAGMITES AUSTRALIS AND TYPHA ORIENTALIS COASTAL FRESHWATER WETLANDS OF THE SYDNEY BASIN BIOREGION

The occurrence of this vegetation type within the development site is illustrated in Figure 5.1 with photographic representation provided in Photo 5.5 and Photo 5.6. A profile of PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion is provided in Table 5.6 and a comparison of recorded vegetation integrity data against community condition benchmark data is presented in Table 5.7.

Table 5.6 Summary of PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion

| <b>PCT 1071 PHRAGMITES AUSTRALIS AND TYPHA ORIENTALIS COASTAL FRESHWATER WETLANDS OF THE SYDNEY BASIN BIOREGION</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCT Justification                                                                                                   | <p>The vegetation type is treeless, permanently waterlogged and comprises of native freshwater wetland species dominated by <i>Typha orientalis</i> (Cumbungi).</p> <p>A quantitative analysis was undertaken for Q6 using the BioNet Vegetation Classification Community Tool (Office of Environment and Heritage 2019a). The IBRA region, vegetation formation, dominant species and community structure were used as search criteria. Due to the low native species diversity recorded, all PCTs with a Freshwater Wetland formation and at least 3 matches were considered further. Those PCTs not known from the Sydney Basin bioregion and not dominated by <i>Typha orientalis</i> were dismissed. The following PCTs were considered candidates:</p> <ul style="list-style-type: none"> <li>— PCT 781 Coastal freshwater lagoons of the Sydney Basin Bioregion and South East Corner Bioregion</li> <li>— PCT 1737 <i>Typha</i> rushland</li> <li>— PCT 1071 <i>Phragmites australis</i> and <i>Typha orientalis</i> coastal freshwater wetlands of the Sydney Basin Bioregion</li> </ul> <p>PCT 781 was dismissed based on the absence of a freshwater or brackish coastal lagoons below 10m in elevation as described in the PCT vegetation description.</p> <p>PCT 1737 plant community profile describes the community as typically occurring at the margins of standing fresh water along the coast from Woy Woy to Hexham. As each of these locations are north of the Subject Land, this PCT was dismissed.</p> <p>PCT 1071 plant community profile description outlines that this community occurs in man-made water bodies, drainage lines and depressions across a wide variety of environments. This PCT in its original form occurs in wide variety of situations associated with coastal plains, valleys, lagoons and other sites of poor drainage. This landscape description was consistent with the Subject Land.</p> <p>Given the above, this freshwater wetland vegetation recorded in the Subject Land was assigned to PCT 1071.</p> |
| Vegetation formation                                                                                                | Freshwater Wetlands                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Vegetation class                                                                                                    | Coastal Freshwater Lagoons                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Vegetation zone                                                                                                     | VZ5 – Moderate condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Conservation status                                                                                                 | This vegetation type forms part of the Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions which is listed as Endangered under the BC Act.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |



| PCT 1071 PHRAGMITES AUSTRALIS AND TYPHA ORIENTALIS COASTAL FRESHWATER WETLANDS OF THE SYDNEY BASIN BIOREGION |                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SAII entity                                                                                                  | No                                                                                                                                                                                               |
| Percent cleared                                                                                              | 75%                                                                                                                                                                                              |
| Patch size class                                                                                             | <5 hectares                                                                                                                                                                                      |
| Area within the subject land                                                                                 | 0.01 hectares                                                                                                                                                                                    |
| Area within the development site                                                                             | 0.00 hectares (impacts avoided)                                                                                                                                                                  |
| Vegetation integrity plots                                                                                   | Moderate condition – Q6                                                                                                                                                                          |
| Current vegetation integrity score                                                                           | <p>Moderate condition:</p> <p>Composition condition score: 25.6</p> <p>Structure condition score: 86.8</p> <p>Function condition score: -</p> <p>Current vegetation integrity score: 47.1</p>    |
| Landscape position                                                                                           | Occurs on waterlogged depressions on alluvial flats associated with Elizabeth Macarthur Creek.                                                                                                   |
| Species upper stratum                                                                                        | Generally absent although scattered juvenile species of <i>Angophora floribunda</i> (Rough-barked Apple) and <i>Casuarina glauca</i> (Swamp Oak) were recorded.                                  |
| Species middle stratum                                                                                       | Absent                                                                                                                                                                                           |
| Species ground stratum                                                                                       | Native species are restricted to <i>Typha orientalis</i> (Cumbungi) with scattered occurrences of <i>Alternanthera denticulata</i> (Lesser Joyweed), <i>Cynodon dactylon</i> (Common Couch)      |
| Vegetation condition                                                                                         | This vegetation type was assigned to a moderate condition state with a vegetation integrity score of 47.1. Exotic species richness was recorded at 18 with a projected vegetation cover of 31.5. |



Photo 5.5 PCT 1071\_Moderate condition patch (Q6)



Photo 5.6 PCT 1071\_Moderate condition patch



Table 5.7 Comparison of PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion plot data against community condition benchmarks

| PLOT                  | TREE RICHNESS | SHRUB RICHNESS | GRASS RICHNESS | FORB RICHNESS | FERN RICHNESS | OTHER RICHNESS | TREE COVER | SHRUB COVER | GRASS COVER | FORB COVER | FERN COVER | OTHER COVER | FALLEN LOGS | LITTER COVER | LARGE TREES | CONDITION        |
|-----------------------|---------------|----------------|----------------|---------------|---------------|----------------|------------|-------------|-------------|------------|------------|-------------|-------------|--------------|-------------|------------------|
| <b>BM<sup>1</sup></b> | <b>1</b>      | <b>2</b>       | <b>5</b>       | <b>4</b>      | <b>1</b>      | <b>1</b>       | <b>0</b>   | <b>0</b>    | <b>122</b>  | <b>2</b>   | <b>0</b>   | <b>0</b>    | -           | -            | -           | <b>Benchmark</b> |
| Q6                    | 2             | 0              | 2              | 1             | 0             | 0              | 2.4        | 0           | 86          | 0.3        | 0          | 0           | -           | -            | -           | Moderate         |

- (1) Benchmark data for equivalent community in Sydney Basin IBRA bioregion (Vegetation Type: PCT 1071 *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion quadrat against community condition benchmarks: Vegetation Formation: Freshwater Wetlands: Vegetation Class: Coastal Freshwater Lagoons: source (Office of Environment & Heritage 2019a).

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## 5.3 NON-NATIVE VEGETATION

### 5.3.1 MISCELLANEOUS ECOSYSTEM – HIGHLY DISTURBED AREAS WITH NO OR LIMITED NATIVE VEGETATION

Areas of vegetation unable to be assigned to a recognised NSW PCT due to low native species diversity forms highly disturbed areas with no or limited native vegetation. Within the subject land, these areas included exotic grasslands and exotic weed plumes and were dominated by exotic grass species such as *Cenchrus clandestinus*\* (Kikuyu Grass), *Eragrostis curvula*\* (African Love Grass), *Panicum maximum*\* (Guinea Grass), *Paspalum dilatatum*\* (Paspalum).

This vegetation type exhibited many priority weeds for the Greater Sydney region, Weeds of National Significance (WONS) and high treat weeds listed under BAM 2017 (Table 4.8). The extent of this non-native vegetation type within the subject land is shown in Figure 5.1 with photographic depictions shown in Photo 5.7 & Photo 5.8.



Photo 5.7 Miscellaneous ecosystem highly disturbed areas with no or limited native vegetation



Photo 5.8 Miscellaneous ecosystem highly disturbed areas with no or limited native vegetation

### 5.3.2 MISCELLANEOUS ECOSYSTEM – URBAN EXOTIC / NATIVE LANDSCAPE PLANTINGS

This non-native vegetation type occurred in discrete patches that have been subject to historic and recent ornamental landscape plantings.

Historic ornamental landscape plantings were associated with former residential dwellings and generally included a mix of exotic and native species including conifers, pines and eucalypt specimens (Photo 5.9).

Many recent ornamental plantings as part of the Sydney Metro Northwest project have been undertaken throughout the subject land. Many of these recent plantings have not been mapped as part of this assessment due to the limited ecological value that they currently exhibit. An example of recent landscape plantings is shown in Photo 5.10.





Photo 5.9      Miscellaneous ecosystem – urban exotic / native landscape plantings (historic)



Photo 5.10      Miscellaneous ecosystem – urban exotic / native landscape plantings (recent)

### 5.3.3 MISCELLANEOUS ECOSYSTEM – WATER BODIES

This non-native vegetation type was mostly comprised of exotic grass and forb species that are the result of disturbance associated with stormwater detention basins. These artificially created water bodies provide limited habitat and are considered to exhibit non-native vegetation (Photo 5.11 and Photo 5.12).



Photo 5.11      Miscellaneous ecosystem – water bodies



Photo 5.12      Miscellaneous ecosystem – water bodies

## 5.4 PRIORITY WEEDS

During field surveys, 178 species of plant were recorded. Of these 41 were native and 137 were introduced species (refer to Appendix C).

Of the 137 introduced species recorded within the subject land, 13 species were listed under the NSW Biosecurity Act 2015 (BA Act) as priority weeds for the Greater Sydney region (Department of Primary Industries, 2018) whilst nine are also listed as Weeds of National Significance (Australian Weeds Committee, 2018). All priority weeds and weeds of National Significance are outlined below in Table 5.8.



Table 5.8 Priority weeds and weeds of national significant recorded within the subject land

| SCIENTIFIC NAME                                            | COMMON NAME      | DUTY UNDER THE BIOSECURITY ACT                                                                                                                                                                                                                                                                                                                                                   | WEED OF NATIONAL SIGNIFICANCE? |
|------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
| <i>Alternanthera philoxeroides</i>                         | Alligator Weed   | Prohibition on dealings: Must not be imported into the State or sold<br><br>Biosecurity Zone: The Alligator Weed Biosecurity Zone is established for all land within the state except land in the following regions: Greater Sydney.                                                                                                                                             | Yes                            |
| <i>Anredera cordifolia</i>                                 | Madeira Vine     | Prohibition on dealings: Must not be imported into the State or sold                                                                                                                                                                                                                                                                                                             | Yes                            |
| <i>Asparagus aethiopicus</i>                               | Ground asparagus | Prohibition on dealings: Must not be imported into the State or sold                                                                                                                                                                                                                                                                                                             | Yes                            |
| <i>Asparagus asparagoides</i>                              | Bridal Creeper   | Prohibition on dealings: Must not be imported into the State or sold                                                                                                                                                                                                                                                                                                             | Yes                            |
| <i>Cestrum parqui</i>                                      | Green Cestrum    | Regional Recommended Measure: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment.                                                                                                                                                                         | No                             |
| <i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i> | Bitou Bush       | Prohibition on dealings: Must not be imported into the State or sold<br><br>Biosecurity Zone: The Bitou Bush Biosecurity Zone is established for all land within the State except land within 10 kilometres of the mean high water mark of the Pacific Ocean between Cape Byron in the north and Point Perpendicular in the south (includes the subject land).                   | Yes                            |
| <i>Cortaderia selloana</i>                                 | Pampas Grass     | Regional Recommended Measure: Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment.<br><br>This Regional Recommended Measure applies to <i>Cortaderia jubata</i> (pink pampas grass)                                                                        | No                             |
| <i>Lantana camara</i>                                      | Lantana          | Prohibition on dealings: Must not be imported into the State or sold                                                                                                                                                                                                                                                                                                             | Yes                            |
| <i>Olea europaea</i> subsp. <i>cuspidata</i>               | African Olive    | Regional Recommended Measure: The Greater Sydney region is classified as the core infestation area.<br><br>Whole region: The plant or parts of the plant are not traded, carried, grown or released into the environment.<br>Core infestation area: Land managers prevent spread from their land where feasible. Land managers reduce impacts from the plant on priority assets. | No                             |
| <i>Opuntia sp.</i>                                         | Prickly Pear     | Prohibition on dealings: Must not be imported into the State or sold                                                                                                                                                                                                                                                                                                             | Yes                            |

| SCIENTIFIC NAME                 | COMMON NAME | DUTY UNDER THE BIOSECURITY ACT                                       | WEED OF NATIONAL SIGNIFICANCE? |
|---------------------------------|-------------|----------------------------------------------------------------------|--------------------------------|
| <i>Rubus fruticosus</i> agg.    | Blackberry  | Prohibition on dealings: Must not be imported into the State or sold | Yes                            |
| <i>Senecio madagascariensis</i> | Fireweed    | Prohibition on dealings: Must not be imported into the State or sold | Yes                            |

## 5.5 THREATENED ECOLOGICAL COMMUNITIES

Native vegetation recorded within the subject land is considered to meet the final determination of three threatened ecological communities listed under the BC Act. These are:

- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
- Cumberland Plain Woodland in the Sydney Basin Bioregion
- Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

A summary of each threatened ecological community, associated PCT and extent within the subject land is summarised in Table 5.9 .

Table 5.9 Threatened ecological communities recorded within the subject land (BC Act)

| VEGETATION TYPE                                                                                                               | ZONE            | THREATENED ECOLOGICAL COMMUNITY                                                                                                     | BC ACT STATUS | EXTENT SUBJECT LAND (HA) |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------|
| PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion | VZ1<br>Poor     | River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | E             | 0.33                     |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion                    | VZ2<br>Moderate | Cumberland Plain Woodland in the Sydney Basin Bioregion                                                                             | CE            | 1.54                     |
|                                                                                                                               | VZ3<br>Poor     |                                                                                                                                     |               | 1.26                     |
| PCT 1071 <i>Phragmites australis</i> and <i>Typha orientalis</i> coastal freshwater wetlands of the Sydney Basin Bioregion    | VZ4<br>Moderate | Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions        | E             | 0.01                     |

A comparison of the final determination for each threatened ecological community and candidate PCT is provided in Table 5.10 to Table 5.12. Each element of the final determination including locality, species composition, characteristic species and resilience is compared to each condition class for candidate PCTs to determine if vegetation recorded within the subject land is consistent with the criterion.

### 5.5.1 RIVER-FLAT EUCALYPT FOREST ON COASTAL FLOODPLAINS OF THE NEW SOUTH WALES NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS

Table 5.10 Correlation of BC Act-listed River-Flat Eucalypt Forest Community and associated PCT 835

| DESCRIPTIVE CRITERIA           | RIVER-FLAT EUCALYPT FOREST TEC                                                                                                                                                                                                     | PCT 835 WITHIN THE SUBJECT LAND                                                                                                                                                             |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bioregion                      | North Coast, Sydney Basin and South East Corner bioregions                                                                                                                                                                         | Subject land is located within the Sydney Basin                                                                                                                                             |
| Landform and altitudinal range | Found on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Generally, occurs below 50 m elevation, but may occur on localised river flats up to 250 m above sea level. | Elevation on the subject lands varied between 60-75m adjacent to riparian areas associated with Elizabeth Mcarthur Creek                                                                    |
| Soil / geology                 | Alluvium; silts, clay-loams and sandy loams                                                                                                                                                                                        | Clay loam soils were recorded                                                                                                                                                               |
| Structure                      | The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees.                                                                             | This condition form occurred as scattered trees due to weed invasion whereby more than 50% of the understorey was comprised of perennial grasses and management of the understorey (mowing) |
| Species assemblage             | There are 88 characteristic species listed for this community. The total species list of the community is larger with many species present at a small number of sites or in low abundance.                                         | All vegetation assigned to this PCT was floristically characteristic of River-flat Eucalypt Forest:<br>— Q8 – 8 characteristic species were recorded                                        |
| Condition threshold            | There is no condition threshold described for this community in the determination.                                                                                                                                                 | All condition forms of this vegetation are considered commensurate with the TEC listing                                                                                                     |
| <b>Conclusion</b>              |                                                                                                                                                                                                                                    | <b>Meets criterion</b>                                                                                                                                                                      |

### 5.5.2 CUMBERLAND PLAIN WOODLAND IN THE SYDNEY BASIN BIOREGION

Table 5.11 A comparison of Cumberland Plain Woodland final determination criteria and PCT 849 attributes within the subject land

| DESCRIPTIVE CRITERIA   | CUMBERLAND PLAIN WOODLAND TEC                                                                                                                                                                                                                                                                            | PCT 849 WITHIN THE SUBJECT LAND                                                                                                                                                               |                                                                         |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|                        |                                                                                                                                                                                                                                                                                                          | Moderate                                                                                                                                                                                      | Poor                                                                    |
| Locality and lithology | Cumberland Plain Woodland is the name given to the ecological community in the Sydney Basin bioregion associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain, a rainshadow area to the west of Sydney's Central Business District | All occurrence of PCT 849 were recorded within the Sydney Basin Bioregion and in areas located in the Cumberland Plain sub-region. Soils recorded within PCT 849 had a strong clay component. |                                                                         |
| Floristic assemblage   | Cumberland Plain Woodland is characterised by the assemblage of species listed in paragraph 3 of the final determination                                                                                                                                                                                 | Sampling plots across all condition classes were analysed for                                                                                                                                 | Sampling plots across all condition classes were analysed for amount of |



| DESCRIPTIVE CRITERIA   | CUMBERLAND PLAIN WOODLAND TEC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | PCT 849 WITHIN THE SUBJECT LAND                                                                                                                                                                                                                                           |                                                                                                                |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Moderate                                                                                                                                                                                                                                                                  | Poor                                                                                                           |
|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>amount of recorded characteristic species:</p> <p>Q3 - 22 characteristic species including, forb and grass species</p> <p>Q4 - 26 characteristic species including, forb and grass species</p> <p>Q7 - 21 characteristic species including, forb and grass species</p> | <p>recorded characteristic species:</p> <p>Q1 – 8 characteristic species including, forb and grass species</p> |
| Structure              | Typically comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. The community also includes ‘derived’ native grasslands which result from removal of the woody strata from the woodlands and forests                                                                                                                                                                                                                                           | PCT 849 in Moderate condition (Q3/Q4/Q7) is comprised of open tree canopy, a near-continuous groundcover dominated by grasses and herbs and shrub layer of mostly characteristic species.                                                                                 | PCT 849 in Poor condition (Q1) where an open tree canopy was comprised of characteristic species.              |
| Characteristic species | Cumberland Plain Woodland is characterised by an upper-storey that is usually dominated by <i>Eucalyptus moluccana</i> (Grey Box) and <i>E. tereticornis</i> (Forest Red Gum), often with <i>E. crebra</i> (Grey Ironbark), <i>E. eugenioides</i> (Narrow-leaved Stringybark), <i>Corymbia maculata</i> (Spotted Gum) or other less frequently occurring eucalypts, including <i>Angophora floribunda</i> , <i>A. subvelutina</i> (Broad-leaved Apple), <i>E. amplifolia</i> (Cabbage Gum) and <i>E. fibrosa</i> (Broad-leaved Ironbark). | <i>Eucalyptus crebra</i> (Narrow-leaved Ironbark) was the dominant canopy species often with <i>E. tereticornis</i> (Forest Red Gum) and <i>Eucalyptus moluccana</i> (Grey Box) forming the sub-dominant species.                                                         | <i>E. tereticornis</i> (Forest Red Gum) were present in all occurrences of PCT 849.                            |
| Locality               | Currently known to occur within the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly, but may occur elsewhere within the bioregion                                                                                                                                                                                                                                                                            | All occurrence of PCT 849 were recorded within the Hills Shire Council Local Government Area.                                                                                                                                                                             |                                                                                                                |
| Conclusion             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Meet criterion                                                                                                                                                                                                                                                            | Meet criterion                                                                                                 |

### 5.5.3 FRESHWATER WETLANDS ON COASTAL FLOODPLAINS OF THE NEW SOUTH WALES NORTH COAST, SYDNEY BASIN AND SOUTH EAST CORNER BIOREGIONS

Table 5.12 Correlation of BC Act-listed Freshwater Wetlands Community and associated PCT 1071

| DESCRIPTIVE CRITERIA                  | FRESHWATER WETLANDS TEC                                                                                                                                                                                                          | PCT 1071 (MODERATE) WITHIN THE SUBJECT LAND                                                                                                                                  |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bioregion</b>                      | North Coast, Sydney Basin and South East Corner bioregions                                                                                                                                                                       | Subject land is located within the Sydney Basin                                                                                                                              |
| <b>Landform and Altitudinal range</b> | Associated with periodic or semi-permanent inundation by freshwater, although there may be minor saline influence in some wetlands                                                                                               | Recorded in freshwater pool of Elizabeth Macarthur Creek                                                                                                                     |
| <b>Soil/geology</b>                   | Typically occur on silts, muds or humic loams in depressions, flats, drainage lines, backswamps, lagoons and lakes associated with coastal floodplains.                                                                          | Recorded in silty soils in moist alluvial depressions.                                                                                                                       |
| <b>Structure</b>                      | The structure of the community may vary from sedgelands and reedlands to herbfields, and woody species of plants are generally scarce. Typically dominated by herbaceous plants and have very few woody species                  | The vegetation is recorded as reedland in both occurrences.                                                                                                                  |
| <b>Species assemblage</b>             | There are 66 characteristic species listed for this community. The total species list of the community is larger with many species present at a small number of sites or in low abundance.                                       | All vegetation assigned to this PCT was floristically characteristic of Freshwater Wetlands.<br>— Q6 – 1 characteristic species, being <i>Typha orientalis</i> was recorded. |
| <b>Condition thresholds</b>           | There is no condition threshold described for this community in the determination.<br><br>Any vegetation in which characteristic native species dominate any structural layer present is considered to constitute the community. | Patches of the community identified have characteristic native species dominant (>75% of species are characteristic) for at least one of the structural layers present.      |
| <b>Conclusion</b>                     |                                                                                                                                                                                                                                  | <b>Meets criterion</b>                                                                                                                                                       |

## 6 THREATENED SPECIES

### 6.1 THREATENED FLORA

#### 6.1.1 THREATENED FLORA POPULATIONS

Background research identified one endangered population that has been previously recorded or has the potential to occur within the locality of the subject land.

- *Wahlenbergia multicaulis* (Tadgell's Bluebell) in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield

Each species was subject to a likelihood of occurrence assessment. (Appendix A and Appendix B) which identified two endangered populations, *Marsdenia viridiflora* subsp. *viridiflora* and *Wahlenbergia multicaulis*, as having a moderate to high likelihood of occurrence, these species became candidate species and were the subject of targeted flora surveys.

#### 6.1.2 THREATENED FLORA CANDIDATE SPECIES

A total of 50 threatened flora species were identified during background research. The BAM credit calculator identified 17 threatened flora species as likely candidate species based on vegetation types identified on the subject land. Of these, five species were considered to have a moderate or high likelihood of occurrence that became candidate species and were the focus of detailed targeted surveys (Table 6.1). An assessment of likelihood of occurrence of all 50 threatened flora species (including the 12 BAM candidate species that are not considered to have habitat within the subject lands) are provided in Appendix A.

No threatened flora species were recorded during targeted surveys.

Table 6.1 Threatened flora candidate species assessment results

| SCIENTIFIC NAME                                      | COMMON NAME              | BC ACT STATUS <sup>1</sup> | SURVEY MONTH | PRESENCE        | JUSTIFICATION                                                                                                                                                                                                                                                                                                                                          | AFFECTED SPECIES? |
|------------------------------------------------------|--------------------------|----------------------------|--------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <i>Acacia pubescens</i>                              | Downy Wattle             | V                          | All year     | No – (surveyed) | The subject land is not located on intergrade geologies between shales and sandstones and characteristic gravelly soils with ironstones were absent. Targeted surveys did not identify any specimens of this species within the subject lands. There are no current records of this species from habitat connected to the subject lands.               | No                |
| <i>Grevillea juniperina</i> subsp. <i>juniperina</i> | Juniper-leaved Grevillea | V                          | All Year     | No – (surveyed) | The subject land is not located on preferred intergrade geologies between Wianamatta Shale and Tertiary alluvium and characteristic lateritic gravels were absent. Targeted surveys did not identify any specimens of this species within the subject lands. There are no current records of this species from habitat connected to the subject lands. | No                |



| SCIENTIFIC NAME                                         | COMMON NAME        | BC ACT STATUS <sup>1</sup> | SURVEY MONTH | PRESENCE        | JUSTIFICATION                                                                                                                                                                                                                                                                                                                           | AFFECTED SPECIES? |
|---------------------------------------------------------|--------------------|----------------------------|--------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <i>Pimelea curviflora</i> var. <i>curviflora</i>        | -                  | V                          | All Year     | No – (surveyed) | The subject land is not located on intergrade geologies between shales and sandstones and characteristic gravely soils with ironstones were absent. Targeted surveys did not identify any specimens of this species within the subject lands. There are no current records of this species from habitat connected to the subject lands. | No                |
| <i>Pimelea spicata</i>                                  | Spiked Rice-flower | E                          | All year     | No – (surveyed) | Targeted surveys involving parallel line traverses, plot and random meanders did not identify any specimens of this species within the subject lands. There are no current records of this species from habitat connected to the subject lands.                                                                                         | No                |
| <i>Wahlenbergia multicaulis</i> - endangered population | Tadgell's Bluebell | E                          | All Year     | No – (surveyed) | Targeted surveys involving parallel line traverses, plot and random meanders did not identify any specimens of this species within the subject lands. There are no current records of this species from habitat connected to the subject lands.                                                                                         | No                |

(1) Listed under the BC Act - E= Endangered, V= Vulnerable

### 6.1.3 AFFECTED THREATENED FLORA

The development footprint is considered unlikely to impact on threatened flora species or their habitats and as such no species are considered affected in terms of project impacts and BAM calculations.

## 6.2 THREATENED FAUNA

Fauna habitat assessments were undertaken within each major vegetation type to assess the conditions of habitat values for fauna and the likelihood of threatened species of fauna to occur within the recorded vegetation types.

Large portions of the subject land are highly modified, consisting of vegetation that has been historically planted as landscape plantings in residential gardens or along road verges. Some areas within subject land contain remnant native vegetation, majority of which occur along Elizabeth Macarthur Creek with isolated patches of grassy woodland vegetation occurrence mostly north of Balmoral Road.

Background research identified 79 threatened fauna species that have been previously recorded or have the potential to occur within the locality. The likelihood of these species occurring within the subject land was determined based on field investigations and fauna habitat available. Background investigations identified several marine migratory birds and marine bird species to occur within the greater locality, however, based on field investigations, no habitat associated with these species was identified within the subject land and thus these species were not considered likely to occur.

Database searches identified 79 threatened fauna species as potentially utilising the habitat found within the subject land. Of these, 15 species were either recorded or assessed as having a moderate or higher likelihood of occurring. Likelihood for all species identified from database searches is provided in Appendix B.

### 6.2.1 PREDICTED THREATENED FAUNA - ECOSYSTEM CREDIT SPECIES

Of the 15 species either recorded or assessed as having a moderate or higher likelihood of occurrence, 12 are considered predicted species under the BAM based on predicted habitat associated with recorded vegetation types. Predicted species do not require detailed targeted survey as they are considered based on potential available foraging habitat characteristics. All BAM predicted species are outlined in Table 6.2.

Table 6.2 BAM predicted threatened fauna species (ecosystem credit species)

| COMMON NAME               | SCIENTIFIC NAME                            | BC ACT | VEGETATION TYPE(S)                                                                                                                                                                                                                  |
|---------------------------|--------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Birds</b>              |                                            |        |                                                                                                                                                                                                                                     |
| Dusky Woodswallow         | <i>Artamus cyanopterus cyanopterus</i>     | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Little Lorikeet           | <i>Glossopsitta pusilla</i>                | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Powerful Owl              | <i>Ninox strenua</i>                       | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Swift Parrot              | <i>Lathamus discolor</i>                   | E      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Varied Sittella           | <i>Daphoenositta chrysoptera</i>           | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| <b>Mammals</b>            |                                            |        |                                                                                                                                                                                                                                     |
| Eastern Bentwing-bat      | <i>Miniopterus schreibersii oceanensis</i> | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Eastern False Pipistrelle | <i>Falsistrellus tasmaniensis</i>          | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |

| COMMON NAME                    | SCIENTIFIC NAME                 | BC ACT | VEGETATION TYPE(S)                                                                                                                                                                                                                  |
|--------------------------------|---------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Eastern Freetail-bat           | <i>Mormopterus norfolkensis</i> | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Greater Broad-nosed Bat        | <i>Scoteanax rueppellii</i>     | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Grey-headed Flying-fox         | <i>Pteropus poliocephalus</i>   | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Little Bentwing-bat            | <i>Miniopterus australis</i>    | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |
| Yellow-bellied Sheath-tail-bat | <i>Saccolaimus flaviventris</i> | V      | 835-Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion<br>849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion |

(1) Listed under the BC Act - E= Endangered, V= Vulnerable

### 6.2.2 CANDIDATE THREATENED FAUNA – SPECIES CREDIT SPECIES

A total of three threatened fauna species were identified during background research and field assessment to have potential to occur within the subject land. Of these, one species is an affected species based off presence of habitat features, known occurrence within the locality and likely utilisation of habitat within the subject land (Table 6.3 and Figure 6.1)

Table 6.3 Candidate threatened fauna (species credit species) results

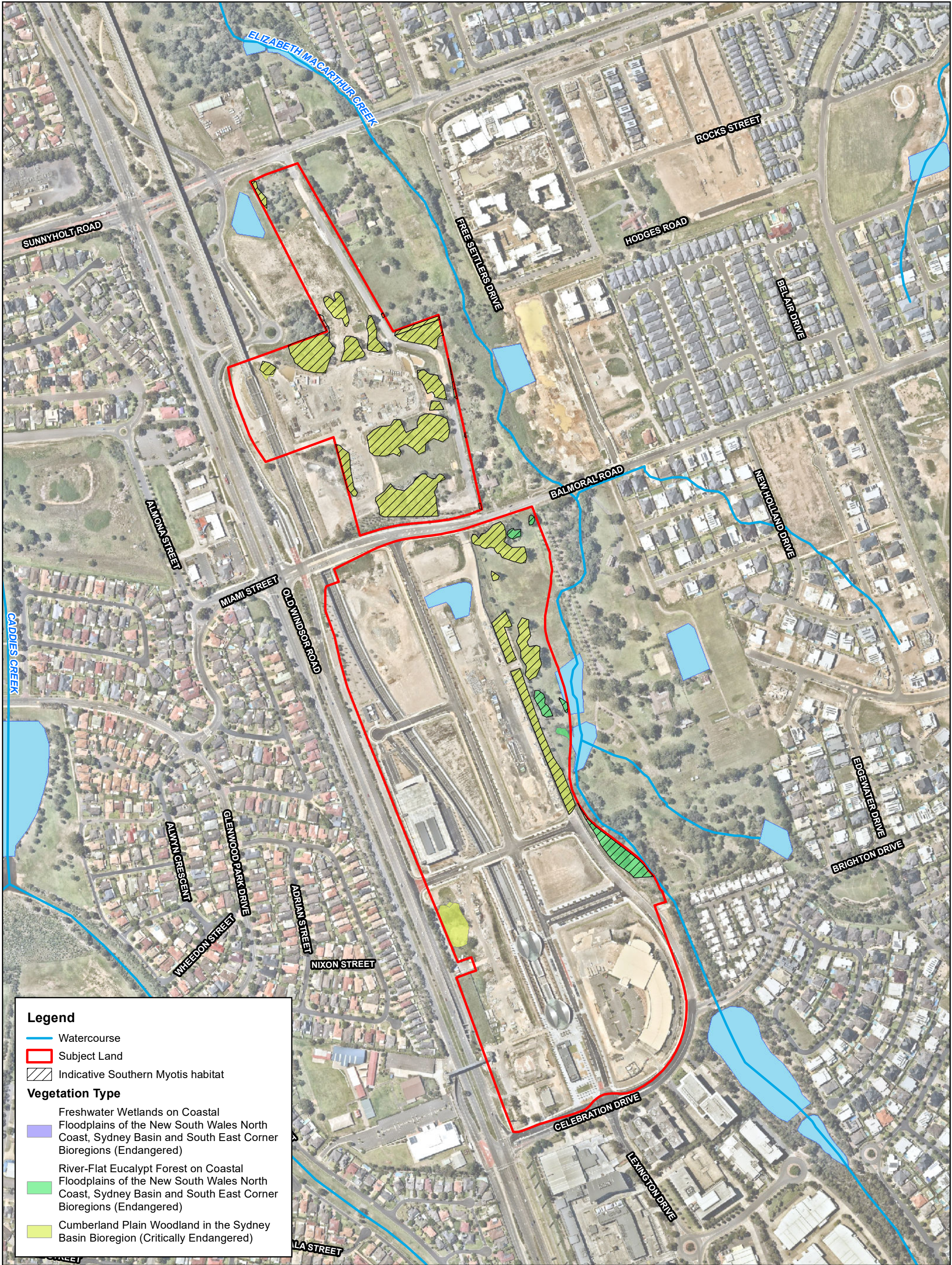
| COMMON NAME     | SCIENTIFIC NAME        | BC ACT | SPECIES PRESENCE        | JUSTIFICATION                                                                                                                                                                                                                                                                                        | AFFECTED SPECIES             |
|-----------------|------------------------|--------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Mammal</b>   |                        |        |                         |                                                                                                                                                                                                                                                                                                      |                              |
| Southern Myotis | <i>Myotis macropus</i> | V      | Yes – (assumed present) | Site access restrictions prevented survey effort. Habitat assessments and field surveys identified hollow-bearing trees within 200 m of riparian zone and presence of foraging habitat (i.e. waterbodies with open water). In addition, the species has numerous recent records within the locality. | Yes – species credit species |



| COMMON NAME           | SCIENTIFIC NAME               | BC ACT | SPECIES PRESENCE | JUSTIFICATION                                                                                                                                                                                                                                                                                                                          | AFFECTED SPECIES          |
|-----------------------|-------------------------------|--------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Invertebrate</b>   |                               |        |                  |                                                                                                                                                                                                                                                                                                                                        |                           |
| Cumberland Land Snail | <i>Meridolum corneovirens</i> | E      | No – (surveyed)  | Targeted surveys undertaken within subject land. No individuals identified.                                                                                                                                                                                                                                                            | No – not assessed further |
| Dural Woodland Snail  | <i>Pommerhelix duralensis</i> | E      | No – (surveyed)  | Microhabitat highly degraded (i.e. minimal presence of fallen timber and shelter habitat) due to construction activities. Subject land highly fragmented from higher quality habitat where the species has been recorded in locality. In addition, previous ecological surveys did not record any individuals within the subject land. | No – not assessed further |

(1) Listed under the BC Act - E= Endangered, V= Vulnerable





**Legend**

- Watercourse
- Subject Land
- Indicative Southern Myotis habitat

**Vegetation Type**

- Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered)
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered)
- Cumberland Plain Woodland in the Sydney Basin Bioregion (Critically Endangered)



# 7 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

In addition to threatened entities listed under the BC Act the following Matters of National Environmental Significance (MNES), listed under the EPBC Act, are considered by this BDAR:

- World Heritage Properties
  - National Heritage Places
  - Wetlands of international importance
  - Listed threatened communities
  - Listed threatened species
  - Listed migratory species
- 

## 7.1 WORLD & NATIONAL HERITAGE PROPERTIES

No world or national heritage properties listed under sections 12 and 12A of the of the EPBC Act occur within the subject land.

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## 7.2 WETLANDS OF INTERNATIONAL IMPORTANCE

No wetlands of international importance were identified within the locality of the subject land.

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## 7.3 THREATENED ECOLOGICAL COMMUNITIES

The protected matters search conducted for this project identified ten predicted threatened ecological community as potentially occurring within the locality. These communities are:

- Blue Gum High Forest of the Sydney Basin Bioregion
- Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion
- Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community
- Coastal Upland Swamps in the Sydney Basin Bioregion
- Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion
- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
- Eastern Suburbs Banksia Scrub of the Sydney Region
- Shale Sandstone Transition Forest of the Sydney Basin Bioregion
- Turpentine-Ironbark Forest of the Sydney Basin Bioregion
- Western Sydney Dry Rainforest and Moist Woodland on Shale

Of these, one threatened ecological community listed under the EPBC Act, being — Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community, was considered as a candidate to occur within the subject



land. An overview and analysis of this ecological community against recorded field data and the conservation listing advice is provided in Section 7.3.1 below.

### 7.3.1 CUMBERLAND PLAIN SHALE WOODLANDS AND SHALE-GRAVEL TRANSITION FOREST

Within the subject land, Cumberland Plain Shale Woodland was recorded in two condition forms, Moderate and Poor, as shown on Figure 5.1.

The listing advice for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest outline the criteria require for a patch of PCT 849 to meet EPBC Status (Threatened Species Scientific Committee 2008).

Within the subject land the Moderate condition form of Cumberland Plain Woodland has been assessed against the thresholds for Cumberland Plain Shale Woodland in Table 7.1 below.

The only PCT on the site that aligns with the EPBC Act listed threatened ecological community Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest community is PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion. Unlike the equivalent BC Act threatened ecological community listing, the EPBC Act listing is defined by specific patch size and condition thresholds in addition to floristic composition and location characteristics. These condition and patch size thresholds are shown and applied to the project in the flowchart below from Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest: A guide to identifying and protecting the nationally threatened ecological community (Department of the Environment 2010).

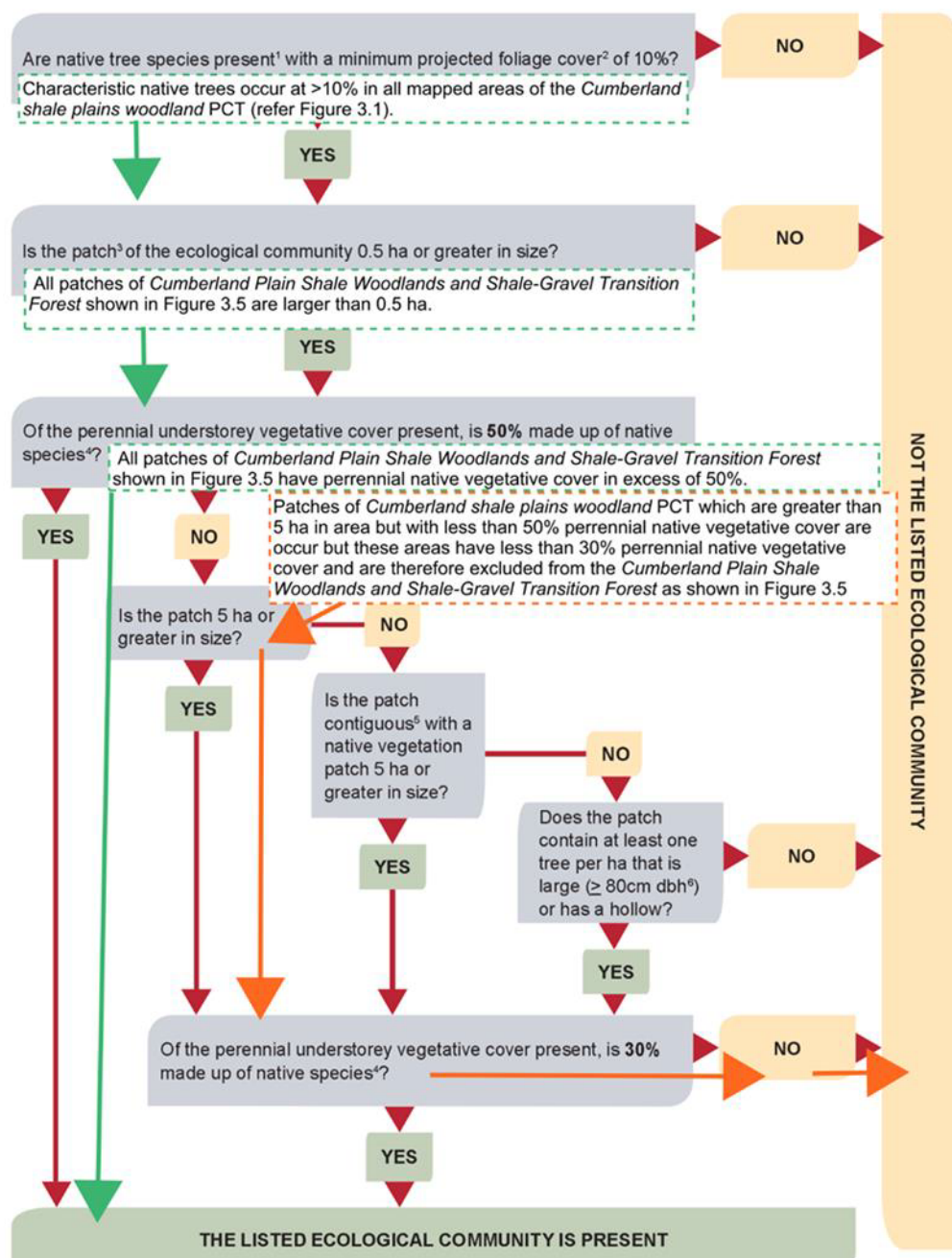
It is important to note that to form part of the EPBC Act listing vegetation must always have an upper tree layer species present and either a shrub or ground layer present, as such Derived Native Grassland or Remnant tree (Poor condition) form of PCT 849 cannot be listed under the EPBC Act. Assessment of vegetation patches were applied against the EPBC Act flow chart guidelines (refer Figure 7.1 and Table 7.1) with the location of each patch that meets EPBC Act thresholds shown in Figure 7.2.

Table 7.1 A comparison of EPBC listed Cumberland Plain Woodland thresholds and recorded PCT 849 (Medium condition) patches

| CATEGORY AND RATIONALE                                                                                                                                                                                              | THRESHOLD                                                                                                                       | WITHIN THRESHOLD FOR LISTING?                                                                                       |                                                                                                                    |                                                                                               |                                                                                               |                                                                                                                    |                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                     |                                                                                                                                 | PATCH 1                                                                                                             | PATCH 2                                                                                                            | PATCH 3                                                                                       | PATCH 4                                                                                       | PATCH 5/6/7                                                                                                        | PATCH 8                                                                                       |
| A. Core thresholds that may apply under most circumstances: patches with an understorey dominated by natives and a minimum size that is functional and consistent with the minimum mapping unit size applied in NSW | Minimum patch size is $\geq 0.5$ ha; AND $\geq 50\%$ of the perennial understorey vegetation cover is made up of native species | <b>Yes.</b> Patch is $>0.5$ and $>50\%$ of the perennial understorey vegetation cover is made up of native species. | <b>Yes.</b> Patch is $>0.5$ and $>50\%$ of the perennial understorey vegetation cover is made up of native species | No. Patch size is $0.08$ ha. This patch will not meet the requirement for category B, C or D. | No. Patch size is $0.41$ ha. This patch will not meet the requirement for category B, C or D. | <b>Yes.</b> Patch is $>0.5$ and $>50\%$ of the perennial understorey vegetation cover is made up of native species | No. Patch size is $0.25$ ha. This patch will not meet the requirement for category B, C or D. |

Figure 7.1

Flowchart for determining presence of EPBC Act listed Cumberland Shale Plains Woodland and Shale-Gravel Transition Forest community



**Notes for Flowchart:** 1. The typical dominant tree species are grey box, forest red gum and red ironbark. Dominant means that one or more of these species comprises 50 per cent or more of the tree cover. Other tree canopy species may occur in association with the typical dominant species and may be locally dominant within the patch at some sites. 2. Projected foliage cover excludes gaps between branches and leaves—for example, the amount of shadow that would be cast on the ground if there were a light source directly overhead. 3. A patch is defined as a discrete and continuous area that comprises the ecological community. It is recognised that patches may occur in a range of sizes and shapes. A patch may include small-scale disturbances, such as tracks or breaks or other small-scale variations in native vegetation that do not significantly alter the overall functionality of the ecological community—for instance, the easy movement of wildlife or dispersal of plant spores and seeds. 4. This determines how much of the understorey is native versus exotic. Perennial understorey vegetation cover includes vascular plant species of the ground and shrub layers with a lifecycle of more than two growing seasons. Measurements of perennial understorey vegetation cover exclude annuals, lichens and mosses, leaf litter or exposed soil. 5. Contiguous means the woodland patch is continuous with, or close to (within 100 m), another patch of vegetation that is dominated by native species in each vegetation layer present. Apart from native vegetation with a tree canopy, adjoining native vegetation may consist of derived grasslands or shrublands. 'Derived' or 'secondary' grasslands or shrublands are sites where the trees have been cleared but the native understorey is retained, giving the appearance of a grassland or shrubland. 6. dbh—diameter at breast height (measured 1.3 m above the base of the tree). Source: (Threatened Species Scientific Committee 2009).





#### Legend

- Watercourse
- Subject Land

#### Threatened Ecological Communities

- Cumberland Shale Plains Woodland and Shale-Gravel Transition Forest - Critically Endangered EPBC Act

Map: BellaVista\_GIS\_014\_A3

Author: T.Bowman

Date: 7/10/2020

Approved by: M.S

Data source: Nearmap 2019



0 100 200 m

1:5,000

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3



Landcom

Bella Vista Station Precinct

Figure 7.2  
Matters of National Environmental Significance

www.wsp.com



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## 7.4 THREATENED SPECIES

### 7.4.1 THREATENED FLORA SPECIES

The protected matters search conducted for this project identified 16 predicted threatened flora species as potentially occurring within the locality. The results of the field surveys and likelihood of occurrence assessments have determined these species to have a low likelihood of occurrence and are not considered to be affected by the project (Appendix A).

### 7.4.2 THREATENED FAUNA SPECIES

Results of EPBC Protected Matters Search Tool identified 50 listed under the EPBC Act as being known to occur or considered likely to occur within the locality (Appendix B). Based off field investigations two EPBC listed species are considered to have a moderate - high likelihood of occurring within the subject lands (Table 7.2).

Table 7.2 Nationally threatened fauna recorded or with a moderate or higher likelihood of occurrence

| SCIENTIFIC NAME               | COMMON NAME            | EPBC ACT <sup>1</sup> | ASSOCIATED HABITAT | LIKELIHOOD OF OCCURRENCE                                                                                                                                                           |
|-------------------------------|------------------------|-----------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Lathamus discolor</i>      | Swift Parrot           | CE                    | PCT 849; PCT 835   | <b>Moderate.</b> Species may utilise the subject land for foraging during seasonal blossom occurrences. Breeding would not occur within subject land, breeding occurs in Tasmania. |
| <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox | V                     | PCT 849; PCT 835   | <b>Moderate.</b> No camps were recorded within the subject land. Species may utilise the vegetation for foraging habitat as part of their broader home range.                      |

(1) Listed under the Commonwealth EPBC Act - CE = Critically Endangered, E= Endangered, V= Vulnerable

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## 7.5 MIGRATORY SPECIES

Migratory species are protected under international agreements to which Australia are a signatory, including Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (RoKAMBA) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered Matters of National Environmental Significance and are protected under the EPBC Act.

Based on EPBC Protected Matters area search and other desktop database searches, 16 migratory fauna species were identified that could occur within the locality. Based on field investigations and habitat assessments no migratory species have been considered to have a moderate to high likelihood to occur within the subject land.

Despite the low likelihood of occurrence for migratory species, it should be noted that migratory species have the potential to utilise a wide variety of habitats, including native vegetation communities found within the subject lands. The habitats within the subject lands are unlikely to constitute important habitat for any of the migratory species. The habitat present is unlikely to support significant proportions of the population of any migratory species nor are the habitats critical to any life stage of migratory species. Due to their mobile nature, the identified species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. As a result of this, the if unexpected occurrence of any migratory species were to occur on the subject land it is not considered that the loss of the vegetation / habitat would be significantly impacted by the development footprint.

# 8 AVOID AND MINIMISING IMPACTS ON BIODIVERSITY VALUES

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## 8.1 AVOIDANCE AND MINIMISING IMPACTS ON BIODIVERSITY VALUES

Section 8.1 of the BAM (Office of Environment & Heritage 2017) details the requirements to avoid and minimise impacts of the project through location and design. Each requirement has been addressed below in Table 8.1.

### 8.1.1 DECISIONS SURROUNDING PROJECT LOCATION

In August 2014, the NSW Government endorsed The Hills Shire Council's nomination for the Kellyville and Bella Vista Station Precincts becoming Priority Precinct (now referred to as Planned Precincts) as a means of implementing the land use and transport planning strategies identified in the North West Rail Link (NWRL) Corridor Strategy (2013).

The key objectives of the Planned Precinct program and NWRL Corridor Strategy were to provide for new housing and jobs in centres with good transport connections to make it easier for people to get to and from home and work and to ensure that supporting infrastructure is provided to meet predicted housing and employment demands.

The Kellyville and Bella Vista Station Precincts were identified to accommodate the housing and employment demands outlined in the NSW Government's A Plan for Growing Sydney (2014).

Prior to initial project design, both precincts were investigated by qualified ecologists to assess the biodiversity and riparian values as part of the broader precinct planning/rezoning process, including lands within the boundary of each concept SSD application site. The assessments identified areas of ecological value that should be retained and protected and identified areas of likely impact, which in turn informed the draft rezonings and accompanying precinct structure plans that were exhibited between 7 December 2015 and 28 February 2016.

At the time, the Office of Environment and Heritage advised it supported the use of E2 Environmental Conservation zones for areas of high ecological constraint values that were to be retained. The Department noted in its Precinct Finalisation Reports, that:

- most of the mapped ecological communities occurred within riparian corridors that would retain their existing RE1 Public Recreation or SP2 Infrastructure land use zoning
- future development would need to minimise potential Cumberland Plain Woodland impacts and conditions of consent may be required to mitigate against potential ecological impacts
- future development control plans should incorporate provisions to ensure vegetation impacts were minimised and mitigated.

On 1 December 2017, the Kellyville and Bella Vista Station Precincts were subsequently rezoned when the then Minister for Planning approved *State Environmental Planning Policy Amendment (Bella Vista and Kellyville Station Precincts) 2017* that amended *State Environmental Planning Policy (State and Regional Development) 2011* and THLEP 2012.

The approved rezonings were made on the basis that both station precincts carried significant strategic merit and would:

- maximise the use of the Sydney Metro North West and other public transport infrastructure
- provide more jobs closer to homes, promote public transport to employment areas, whereby reducing the need for private vehicle trips
- respond to the strong current and future predicted demand for additional employment and housing.



The approved rezonings and proposed urbanisation of both precincts strongly align with the Greater Sydney Commission's housing and employment targets for The Hills Shire as set out in its Central City District Plan and associated priorities and actions. This includes the priority of accommodating the predicted growth demand of 207,500 dwellings across the district by the year 2036.

As such, the retention of remnant Cumberland Plain Woodland patches identified which occur outside of the riparian corridors and existing RE1 zoned land would compromise the NSW Government's priorities and actions for the Central City District from being realised.

The principles in Section 8.1.1.3 of the BAM (Office of Environment & Heritage 2017) have been applied to avoid and minimise impacts on native vegetation and habitat where practical, through the project masterplan development process as described in Table 8.1. Areas of high biodiversity value (Cumberland Plain Woodland) and other areas of native vegetation which can be avoided without compromising commitment to the Central City District Plan and associated priorities and actions are proposed to be retained within planned open space areas and other site locations where their retention is practical.

Future applications for the detailed design and construction of civil infrastructure and built form would further investigate the potential for the retention of native vegetation within allotments and open space parkland areas. All residual impacts unable to be avoided will be offset through the Biodiversity Offset Scheme.

Table 8.1 Project consistency with principles of the BAM to avoid and minimise impacts to biodiversity values

| PRINCIPLES                                                                                                                                                                                                                                    | PROJECT CONSISTENCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Locating the Project to avoid and minimise impacts on native vegetation (section 8.1.1.3 of BAM)</b>                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <i>Locating the Project in areas where there are no biodiversity values</i>                                                                                                                                                                   | Areas of biodiversity value could not be entirely avoided without compromising the NSW Government's priorities and actions for the Central City District. Bella Vista Station Precinct was investigated by qualified ecologists to determine biodiversity values across the Project site and inform draft rezonings and accompanying precinct structure plans which were exhibited between 7 December 2015 and 28 February 2016. Further design changes following and in response to findings of WSP field surveys in 2018 and 2019 have prioritised the utilisation of areas with no or limited biodiversity values (such as existing disturbance areas and areas of non-native vegetation) as much as practical within design and project limitations.                                                                                                                                                                                                  |
| <i>Locating the Project in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)</i>                                                          | <p>The rezoning of Bella Vista Station Precinct and accompanying precinct structure plans was informed by investigations carried out by qualified ecologists to determine biodiversity values between 2015 and 2016. Further design changes following and in response to WSP field surveys in 2018 and 2019 have prioritised the utilisation of native vegetation which holds the lowest biodiversity value (lowest vegetation integrity score) within design and project limitations.</p> <p>Areas of vegetation with the highest biodiversity value such as Cumberland Plain Woodland and riparian corridors have been excluded where practical and retained within planned open space areas and other site locations where their retention.</p>                                                                                                                                                                                                        |
| <i>Locating the Project in areas that avoid habitat for species that have a high biodiversity risk weighting or native vegetation that is a critically endangered ecological community (CEEC) or an endangered ecological community (EEC)</i> | <p>Concept proposal for the future development of the Bella Vista Station Precinct will impact on the Critically Endangered Cumberland Plain Woodland and Endangered River-flat Eucalypt forest community.</p> <p>All areas of the endangered ecological communities (EECs) could not be entirely avoided without compromising the NSW Government's priorities and actions for the Central City District</p> <p>The concept proposal has been designed to minimise impacts to the EECs through rezoning and development of precinct structure plans which was informed by investigations carried out by qualified ecologists to determine biodiversity values between 2015 and 2016. Further design changes following and in response to WSP field surveys in 2018 and 2019 have included detailed design modifications to the project footprint to incorporate open space zoning in order retain areas with the highest biodiversity risk weighting.</p> |



| PRINCIPLES                                                                                                                                                                                                | PROJECT CONSISTENCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                           | <p>Cumberland Plain Woodland has the highest biodiversity risk weighting. A total of 0.79 hectares was avoided through detailed design and will be retained in an open space zoning.</p> <p>Through avoidance of riparian areas during detailed design, impacts to River-flat Eucalypt forest community have been reduced to 0.06 hectares. Most of this community occurs along Elizabeth Macarthur Creek and will be retained post development and subject to riparian management.</p> <p>Future applications for the detailed design and construction of civil infrastructure and built form would further investigate the potential for the retention of native vegetation within allotments and open space parkland areas.</p>                 |
| <i>Locating the Project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained.</i>                                           | <p>The development footprint has been designed adjacent to existing residential development, the design will not further disconnect or fragment existing corridors or connectivity for wildlife movement. Tracts of vegetation such as riparian corridors have been avoided as much as possible to maintain habitat connectivity.</p> <p>As such, the development footprint impact on habitat connectivity is likely to be low.</p>                                                                                                                                                                                                                                                                                                                |
| <b>Consideration of alternatives (section 8.1.1.4 of the BAM)</b>                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>An analysis of alternative modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology</i>                       | Design and construction works will be recommended to avoid direct impacts to local creek lines and tributaries – i.e. Elizabeth Macarthur Creek                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>An analysis of alternative routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route</i>                                                   | <p>Multiple design options were workshopped and reviewed to ensure the masterplan was developed with the highest retention of biodiversity values (i.e. highest vegetation integrity score). The following design recommendations were implemented:</p> <ul style="list-style-type: none"><li>— Design lots adjacent to existing development where current APZ are to limit new fragmentation and limit clearing of riparian native vegetation</li><li>— Design roads to occur adjacent to native vegetation to act as APZ buffer and minimise indirect impacts of future development (i.e. rubbish dumping)</li><li>— Modified the masterplan layout to avoid impacts on the Critically Endangered Cumberland Plain Woodland community.</li></ul> |
| <i>An analysis of alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location</i>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <i>An analysis of alternative sites within a property on which the Project is proposed that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Designing a project to avoid and minimise impact on native vegetation and habitat (section 8.1.2.1 of BAM)</b>                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| PRINCIPLES                                                                                                                                                                                    | PROJECT CONSISTENCY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Reducing the clearing footprint of the Project</i>                                                                                                                                         | <p>The clearing of native vegetation has been reduced through detailed design as much as possible without compromising the NSW Government's priorities and actions for the Central City District</p> <p>During future development application phases of the final development, the footprint and layout of temporary construction sites and permanent sites will be determined. Design and construction works will be recommended to avoid direct impacts to vegetation in high threat status categories (e.g. an EEC or CEEC), particularly near Elizabeth Macarthur Creek.</p>                        |
| <i>Locating ancillary facilities in areas where there are no biodiversity values</i>                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)</i> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)</i>                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>Providing structures to enable species and genetic material to move across barriers or hostile gaps</i>                                                                                    | <p>The existing patches of native vegetation within the Development Footprint are small, fragmented and generally isolated from larger areas of native vegetation. The development footprint is not considered likely to further isolate any area of biodiversity value such that genetic material will become unable to move across barriers of hostile gaps within the subject land. Elizabeth Macarthur Creek is considered to provide some limited connectivity in the locality and this area will be subject to riparian management that will improve the biodiversity values of this habitat.</p> |
| <i>Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.</i>                 | <p>Mitigation measures will be developed to address the direct and indirect impacts of the project and are outlined in section 10. These will be reviewed and updated in future design phases associated with the development approval process.</p>                                                                                                                                                                                                                                                                                                                                                     |



# 9 ASSESSMENT OF IMPACTS

## 9.1 REMOVAL OF NATIVE VEGETATION AND HABITAT

The direct and indirect impacts of the Project on clearing of native vegetation, threatened ecological communities and threatened species habitat are discussed in this section.

### 9.1.1 DIRECT IMPACTS ON NATIVE VEGETATION AND HABITAT

The impacts of the development footprint on native vegetation are shown below. The area of each PCT, its legislative status and area to be impacted within the development footprint is shown below in Table 9.1. Discussion of relevant key threatening processes related to direct impacts on vegetation are shown in Table 9.2.

Table 9.1 Direct impacts to native vegetation

| VEGETATION TYPE                                                                                                               | ZONE            | THREATENED ECOLOGICAL COMMUNITY                                                                                                     | BC ACT STATUS | EXTENT DEVELOPMENT FOOTPRINT (HA) |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------|
| PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion | VZ1<br>Poor     | River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | E             | 0.06                              |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion                    | VZ2<br>Moderate | Cumberland Plain Woodland in the Sydney Basin Bioregion                                                                             | CE            | 0.75                              |
|                                                                                                                               | VZ3<br>Poor     |                                                                                                                                     |               | 1.04                              |
| PCT 1071 <i>Phragmites australis</i> and <i>Typha orientalis</i> coastal freshwater wetlands of the Sydney Basin Bioregion    | VZ4<br>Moderate | Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions        | E             | 0.00                              |
| <b>Total direct impact on native vegetation</b>                                                                               |                 |                                                                                                                                     |               | <b>1.85</b>                       |

(1) Listed under the BC Act – CE= Critically Endangered, E= Endangered

Table 9.2 Key threatening processes associated with the removal of native vegetation

| KEY THREATENING PROCESSES                                                     | LEGISLATION |        |          | IMPACT OF THE PROJECT                                                                                                                                                                                         |
|-------------------------------------------------------------------------------|-------------|--------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                               | BC Act      | FM Act | EPBC Act |                                                                                                                                                                                                               |
| Clearing of native vegetation                                                 | ✓           | -      | -        | The Project will contribute to these processes through the clearing of two native plant communities as shown in Table 9.1.                                                                                    |
| Land clearance                                                                | -           | -      | ✓        |                                                                                                                                                                                                               |
| Degradation of native riparian vegetation along New South Wales water courses | -           | ✓      | -        | The project will contribute to this process through the clearing of 0.06 ha of PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion. |

### 9.1.2 DIRECT IMPACT ON THREATENED FLORA SPECIES

No threatened flora species or their habitat, listed under BC Act, have been determined to be affected by the project.

### 9.1.3 DIRECT IMPACT ON THREATENED FAUNA SPECIES

One candidate species, Southern Myotis was identified as affected by the project. Impacts to candidate threatened fauna species and their habitat are outlined in Table 9.3 below.

Table 9.3 Direct impact on threatened fauna species

| COMMON NAME     | SCIENTIFIC NAME        | BC ACT STATUS <sup>1</sup> | HABITAT OR INDIVIDUALS IN THE DEVELOPMENT FOOTPRINT                                                                                                                  | EXTENT HABITAT TO BE IMPACTED (HA) |
|-----------------|------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Southern Myotis | <i>Myotis macropus</i> | V                          | PCT 835 & PCT 849 where it is within 200m of a waterbody with pools/ stretches 3m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies | 1.60                               |

(1) Listed under the BC Act - V= Vulnerable

### 9.1.4 LOSS OF BREEDING HABITATS

The loss of breeding habitat such as hollow-bearing trees has the potential to affect native animals such as;

- Hollow-dependent bats (including the threatened species Southern Myotis)
- Hollow-nesting and canopy-nesting birds
- Arboreal mammals
- Reptiles.

Loss of hollow-bearing trees is currently assumed to be 9 based on data recorded during vegetation integrity plots and random meander surveys. The total number of hollow-bearing trees to be impacted will be quantified during detailed design and pre-clearing surveys.



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## 9.2 INDIRECT IMPACTS ON NATIVE VEGETATION AND HABITAT

This section outlines the general indirect impacts which can occur when the project or activities relating to the construction or operation have a negative effect on native vegetation, threatened ecological communities and/or threatened species habitat.

### 9.2.1 REDUCED VIABILITY OF ADJACENT HABITAT DUE TO EDGE EFFECTS

Edge effects create vulnerable areas subject to degradation by the establishment and spread of weeds, enriched run-off from road pavement and dumping of rubbish and have the potential to reduce the viability of adjacent habitat long-term. It is listed as a Key Threatening Processes under BC Act.

Currently, edge effects from existing residential development impact native vegetation particularly through weed invasion. As the development involves clearing into good condition native vegetation this impact is likely to exacerbated and introduce this impact into additional areas of native vegetation and habitat.

The vegetation recorded within the subject land mostly occurred in along the edges of existing residential housing with some degree of weed invasion. Vegetation recorded in moderate-good condition and/or with connectivity to larger patches of vegetation is most vulnerable to edge effects.

The general subdivision layout has been designed with a perimeter road that adjoins most areas of retained native vegetation. This is expected to reduce edge effects from residential dwellings and uncontrolled stormwater runoff.

### 9.2.2 TRANSPORT OF WEEDS FROM THE SITE TO ADJACENT VEGETATION

The clearing of native vegetation for the development due to earthworks carried out would increase the potential for weed invasion into native vegetation adjacent to the site. Areas where the development footprint occurs are directly adjacent to native vegetation that would be highly susceptible to weed establishment as these areas were recorded in moderate condition to good condition or have connectivity to larger areas of native vegetation.

The introduction or spread of weed species into APZ areas is less concerning as they are managed (mowed/slashed) and less likely to provide quality habitat. Even so, management measures would be required to minimise the risk of introduction and spread of weeds.

This indirect impact corresponds to several Key Threatening Processes listed under BC Act:

- Invasion and establishment of exotic vines and scramblers
- Invasion, establishment and spread of *Lantana camara* (Lantana)
- Invasion of native plant communities by *Olea europaea subsp. cuspidate* (African Olive)
- Invasion of native plant communities by *Chrysanthemoides monilifera* (Bitou Bush)
- Invasion of native plant communities by exotic perennial grasses
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

### 9.2.3 TRANSPORT OF PATHOGENS FROM THE SITE TO ADJACENT VEGETATION

The project has the potential to increase the spread of pathogens that threaten native biodiversity values, such as the soil-borne pathogen *Phytophthora cinnamomi* (Phytophthora) and *Austropuccinia psidii* (Myrtle rust).

Phytophthora infects root systems whereas Myrtle Rust deforms leaves and leads to heavy defoliation. Both pathogens are associated with damage and death to native plants and may be dispersed over large distances. Phytophthora can be spread through flowing water, such as storm runoff, or may be spread within a site via mycelial growth from infected roots to roots of healthy plants. Propagules of Phytophthora may also be dispersed by vehicles (eg cars and earth moving equipment), animals, walkers and movement of soil. Myrtle rust spores can be spread easily via contaminated clothing, hair, skin and personal items, infected plant material, equipment as well as by insect/animal movement and wind dispersal.

The project's construction activities are likely to lead to an increased risk of dispersal of Phytophthora and/or Myrtle Rust through works involving soil disturbance.

This indirect impact corresponds to several Key Threatening Processes listed under BC Act:

- Infection of native plants by *Phytophthora cinnamomi*
- Introduction and establishment of Exotic Rust Fungi of the order *Pucciniales* pathogenic on plants of the family *Myrtaceae*.

#### 9.2.4 REDUCED VIABILITY OF ADJACENT HABITAT DUE TO NOISE, DUST OR LIGHT SPILL

Noise, dust, light and contaminant pollution are indirect impacts that are likely to result from activities associated with both project options. These impacts are likely to have cumulative effects. Noise, dust, light and contaminant pollution are likely to occur from all project activities, although will be greatest where activities take place near vegetated areas and during construction.

During all stages of the project increased noise and vibration levels in the subject land and immediate surrounds are likely due to vegetation clearing, ground disturbance, machinery and vehicle movements, and general human presence. The noise and vibration from activities associated with the Project would potentially disturb fauna and may disrupt foraging, reproductive, or movement behaviours. The impacts from noise emissions are likely to be localised to the construction areas and are not considered likely to have a significant, long-term impact on wildlife populations outside the area of impact.

Elevated levels of dust may be deposited onto the foliage of vegetation adjacent to the project activities. This has the potential to reduce photosynthesis and transpiration and cause abrasion and heating of leaves resulting in reduced growth rates and decreases in overall health of the vegetation. Dust is likely to be generated throughout the lifecycle of the project, although dust pollution is likely to be greatest during periods of substantial earthworks, vegetation clearing, vehicle movements for construction and decommissioning activities and during adverse weather conditions. However, deposition of dust on foliage is likely to be highly localised, intermittent, and temporary and is therefore not considered likely to be a major impact of the project.

Ecological light pollution is the descriptive term for light pollution that includes direct glare, chronic or periodic increased illumination, and temporary unexpected fluctuations in lighting (including lights from a passing vehicles), that can have potentially adverse effects on wildlife (Longcore and Rich, 2004). It has been assumed that some night works would be required during construction and lighting will be installed on the roadside. As such, the immediate area surrounding the Project activities, and areas lit during operation, will be subject to artificial lighting, essentially creating permanent 'daylight' conditions. Ecological light pollution may potentially affect nocturnal fauna by interrupting their life cycle. Some species (i.e. light tolerant microchiropteran bats) may benefit from the lighting due to increased food availability (insects attracted to lights) around these areas.

Due to the frequency and sustained nature of the lighting, it is likely that animals would alter their behaviour in response to the light disturbance and a long-term impact around lighting is likely. Due to the urban environment of the subject land most, if not all, areas of habitat are already impacted by ecological light pollution associated with existing fixed lighting, residences and road vehicle movements. The changes to light conditions associated with the project, though essentially permanent, would therefore be unlikely to have a significant impact on local fauna populations. Lighting associated with

the project would be designed to minimise 'light spill' for the benefit of surrounding residents and this would also reduce potential impacts on fauna populations.

During the construction phase, localised release of contaminants (i.e. hydraulic fluids, oils, fluids, etc.) into the surrounding environment (including drainage lines) could accidentally occur. The most likely result of contaminant discharge would be the localised contamination of soil and potential direct physical trauma to flora and fauna that encounter contaminants. Any accidental release of contaminants is likely to be localised and would be unlikely to have a significant effect on the environments of the subject land, particularly due to the implementation of mitigation measures to immediately address any spills.



## 9.3 IMPACT ON NATIVE VEGETATION AND HABITAT SUMMARY

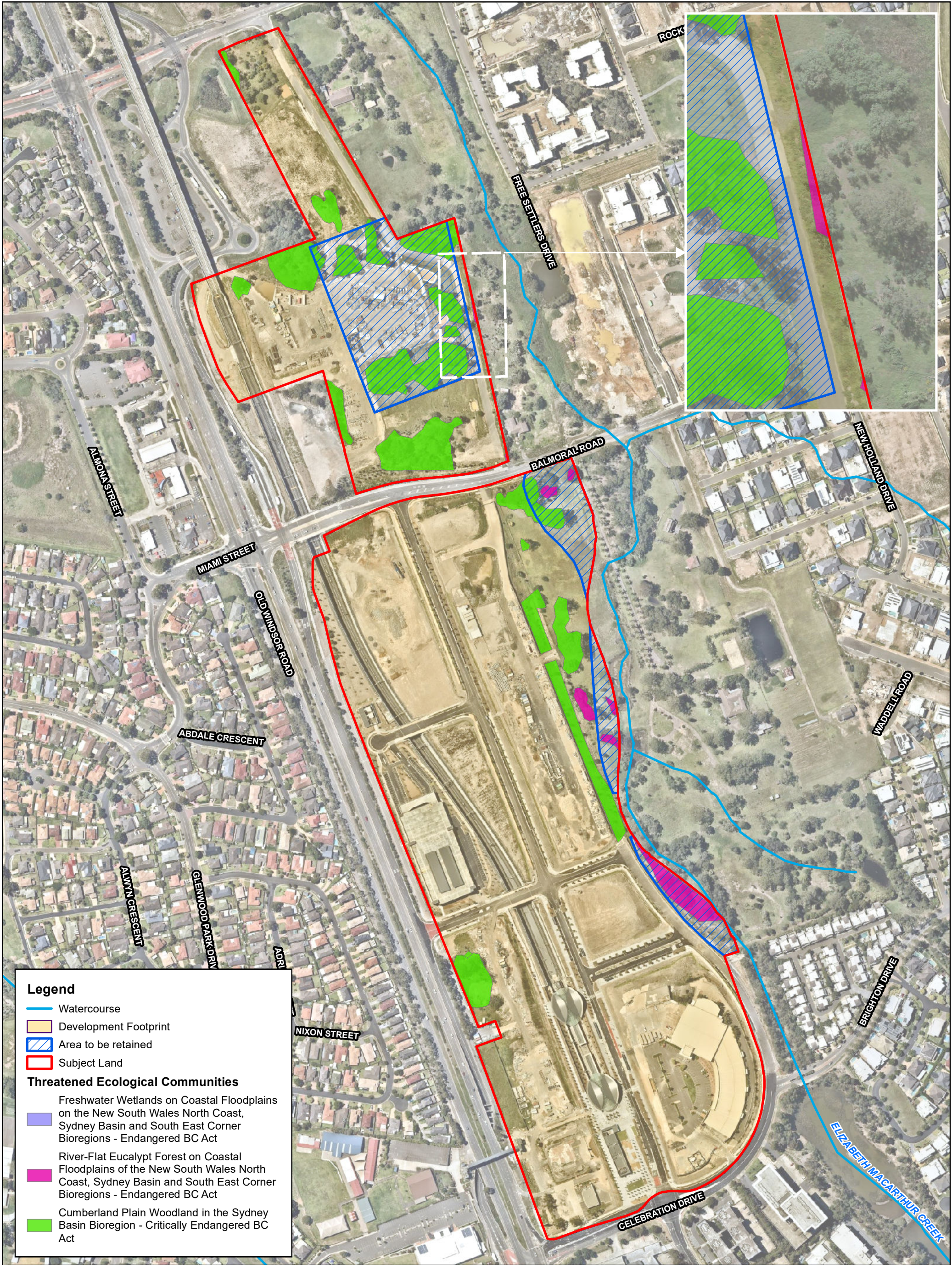
This section summaries the direct and indirect impacts of the Project unable to be avoided in accordance with section 9.1 and 9.2 of the BAM.

Table 9.4 Impact summary

| IMPACT TYPE                                   | NATURE/CONSEQUENCE                                                                                                            | EXTENT                                                   | FREQUENCY                                       | DURATION                                   | TIMING                |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-----------------------|
| Direct impacts                                |                                                                                                                               |                                                          |                                                 |                                            |                       |
| Loss of native vegetation                     | PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion | 0.06 ha                                                  | During construction                             | During construction                        | Short-term            |
|                                               | PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion                    | 1.79 ha                                                  |                                                 |                                            |                       |
| Loss of threatened ecological communities     | River-Flat Eucalypt Forest on Coastal Floodplains EEC                                                                         | 0.06 ha                                                  | During construction                             | During construction                        | Short-term            |
|                                               | Cumberland Plain Woodland in the Sydney Basin Bioregion EEC                                                                   | 1.79 ha                                                  |                                                 |                                            |                       |
| Loss of foraging habitat for threatened fauna | Southern Myotis                                                                                                               | 1.60 ha                                                  | During construction                             | During construction                        | Short-term            |
| Indirect Impacts                              |                                                                                                                               |                                                          |                                                 |                                            |                       |
| Edge effects                                  | Reduced viability of adjacent vegetation                                                                                      | Potentially extent into adjacent vegetation and habitats | Daily, during construction and operation phases | During construction and operational phases | Potentially long-term |

| IMPACT TYPE                | NATURE/CONSEQUENCE                                                                                                                        | EXTENT                                                                                                       | FREQUENCY                                       | DURATION                                   | TIMING                |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------------|-----------------------|
| Weeds                      | Spread and/or introduction of weeds                                                                                                       | Potentially spread to adjacent vegetation and habitats                                                       | Daily, during construction and operation phases | During construction and operational phases | Potentially long-term |
| Pathogens                  | Reduced quality of vegetation and habitat in adjacent environment<br>Introduce / spread pathogens into adjacent environment / populations | Potentially spread or be introduced into adjacent vegetation and habitats as well as local fauna populations | Daily, during construction and operation phases | During construction and operational phases | Potentially long-term |
| Noise, dust or light spill | Reduced viability of adjacent vegetation                                                                                                  | Potentially extent into adjacent vegetation and habitats                                                     | Daily, during construction and operation phases | During construction and operational phases | Potentially long-term |
| Loss of breeding habitats  | Loss of hollow-bearing trees which provide breeding habitat for fauna                                                                     | Vegetation within the development footprint                                                                  | During construction                             | During construction and operational phases | Potentially long-term |





**Legend**

- Watercourse
- Development Footprint
- Area to be retained
- Subject Land

**Threatened Ecological Communities**

- Freshwater Wetlands on Coastal Floodplains on the New South Wales North Coast, Sydney Basin and South East Corner Bioregions - Endangered BC Act
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions - Endangered BC Act
- Cumberland Plain Woodland in the Sydney Basin Bioregion - Critically Endangered BC Act



## 9.4 PRESCRIBED BIODIVERSITY IMPACTS

Prescribed biodiversity impacts are outlined under section 9.2 of the BAM and addressed below.

### 9.4.1 AREAS OF GEOLOGICAL SIGNIFICANCE

No areas of geological significance are present. No caves which may provide potential breeding habitat for bats were recorded.

### 9.4.2 HUMAN MADE STRUCTURES AND NON-NATIVE VEGETATION

No human made structures have been identified within the site that would provide suitable habitat for any threatened species.

Three non-native vegetation type has been recorded within the development footprint. This non-native vegetation type and extent within the site and the project impact area is outlined in Table 9.5 and shown in Figure 5.1.

Table 9.5 Development footprint impacts on non-native vegetation types

| NON-NATIVE VEGETATION TYPE                                                          | DEVELOPMENT FOOTPRINT (HA) |
|-------------------------------------------------------------------------------------|----------------------------|
| Miscellaneous ecosystem highly disturbed areas with no or limited native vegetation | 3.20                       |
| Miscellaneous ecosystem – urban exotic / native landscape plantings                 | 0.76                       |
| Miscellaneous Ecosystem (Water bodies)                                              | 0.11                       |
| <b>Total</b>                                                                        | <b>4.07</b>                |

Based on targeted field surveys and habitat assessments, this non-native vegetation type has been assessed as providing limited to no habitat for any threatened species listed under the BC Act.

### 9.4.3 CONNECTIVITY AND MOVEMENT

The site is isolated from any large patches of native remnant vegetation and is surrounded by industrial development. Given this, the project is not considered likely to adversely impact wildlife connectivity or movement in the locality.

### 9.4.4 HYDROLOGY

The project will not result in any adverse changes to the local hydrology and the project has been designed to maintain existing compensatory flood storage levels. The project will not directly impact on any watercourse and stormwater management will be appropriately addressed through water sensitive urban design.

During construction, ground surface disturbances have the potential to cause pollution of adjacent waterbodies open Sydney Water drainage channel and as such mitigation measures have been provided in section 10 to address these impacts.

### 9.4.5 VEHICLE STRIKE

The site is in a busy residential / commercial area within Sydney, subject to high levels of vehicular traffic. Given the existing high levels of daily traffic, the project is unlikely to increase the number of truck movements per day. The project is unlikely to increase the risk of fauna mortality or injury because of vehicle strike even when considering slightly elevated truck movement during construction. Few terrestrial fauna species occur in the site that are at risk of vehicle strike. The risk of vehicle strike is unlikely to have a substantial impact on any local populations of fauna species.

## 9.5 SERIOUS AND IRREVERSIBLE IMPACTS

This section identifies every potential serious and irreversible impact (SAII) entity that are listed in the Guidance to assist a decision-maker to determine a serious and irreversible impact that would be impacted on by the development footprint.

Impact assessment of potential entities of SAII impacts on biodiversity values are outlined under section 10.2 of the BAM and addressed below.

Identification and an assessment of the impacts which are potential serious and irreversible impacts, in accordance with Subsections 10.2.2 for impacts on ecological communities and 10.2.3 for threatened species.

### 9.5.1 THREATENED ECOLOGICAL COMMUNITIES

To assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact, the BDAR must contain details of the assessment of SAII, in accordance with the assessment criteria set out in the Biodiversity Assessment Method.

The following two threatened ecological communities are likely to be impacted by the Project.

- Cumberland Plain Woodland in the Sydney Basin Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Of these, Cumberland Plain Woodland in the Sydney Basin Bioregion was identified as candidate SAII entities in Appendix 3 of *Guidance to assist a decision-maker to determine a serious and irreversible impact* (Office of Environment and Heritage 2017b).

An assessment of Cumberland Plain Woodland in the Sydney Basin Bioregion against serious and irreversible impacts on ecological communities in accordance with section 10.2.2 of the BAM is provided in Table 9.6.

Table 9.6 SAII assessment for threatened ecological communities

| ASSESSMENT REQUIREMENT                                                                                                                                                                                                         | CUMBERLAND PLAIN WOODLAND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>(a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII</i>                                                                                                           | <p>A total of 1.79 ha of Cumberland Plain Woodland will be impacted. A total of 1.01 hectares of Cumberland Plain Woodland has been avoided through detailed design and will be retained. Of this, 0.79 ha was in moderate condition and 0.222 ha was in poor condition.</p> <p>Indirect impacts will be managed through rehabilitating adjoin riparian vegetation associated with Elizabeth Macarthur Creek and through the implementation of mitigation measures as part of any future development approval.</p> |
| <i>(b) the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone</i> | <p>The direct impacts to this SAII entity is:</p> <ul style="list-style-type: none"><li>— Moderate condition with a vegetation integrity score of 67.9 will be 0.75 ha</li><li>— Poor condition with a vegetation integrity score of 31.5 will be 1.04 ha</li></ul> <p>Indirect impacts have the potential to further affect 0.64 ha of moderate condition and 0.22 of poor condition vegetation.</p>                                                                                                              |



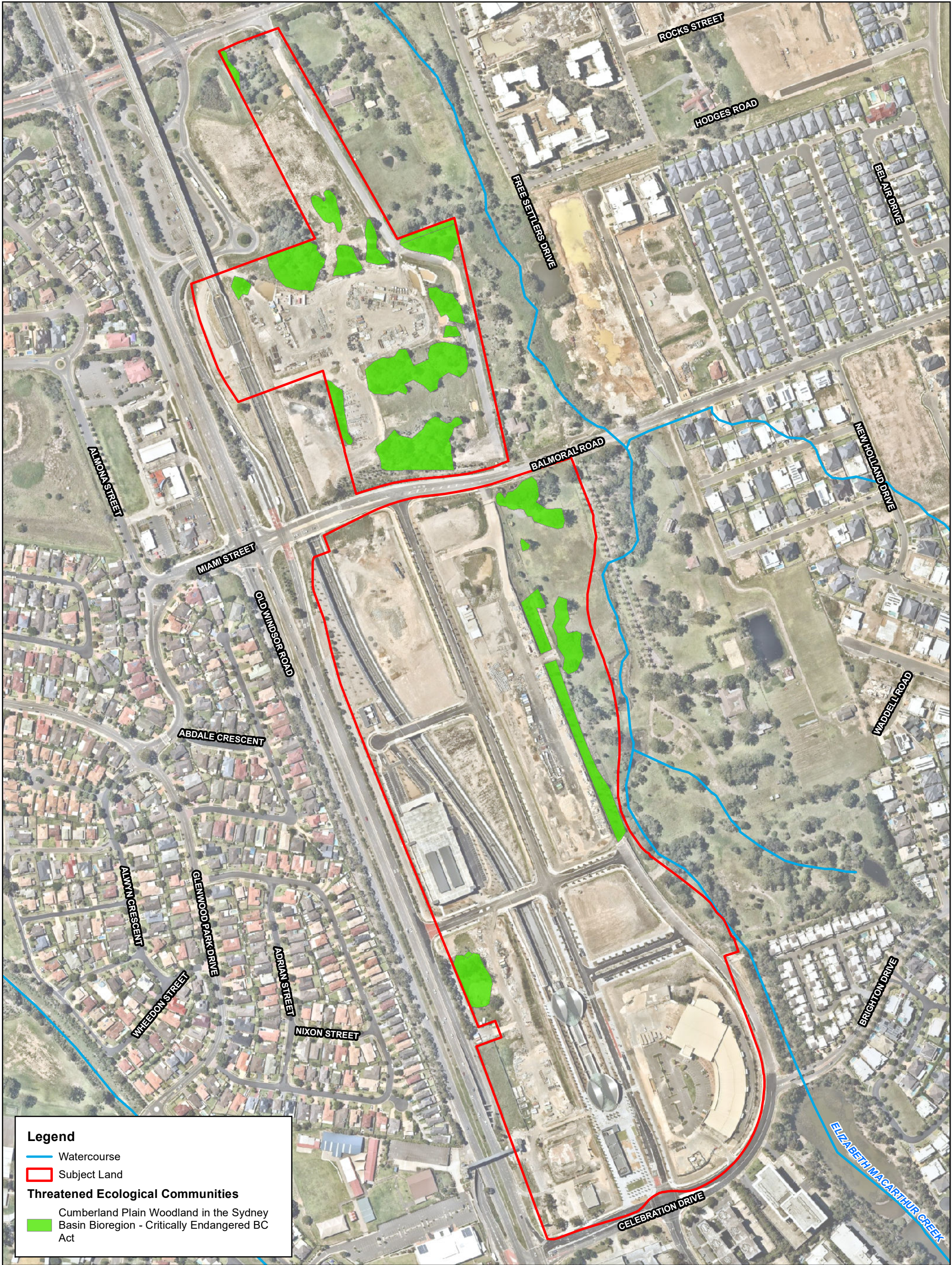
| ASSESSMENT REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CUMBERLAND PLAIN WOODLAND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Indirect impact will be managed through long term vegetation management of retained open space patches and riparian management of Elizabeth Macarthur Creek.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <i>(c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | To date no thresholds have been issued for this SAI entity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <i>(d) the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The subject land occurs within the high density residential and commercial suburb that was historically cleared for rural agricultural. The extent of Cumberland Plain Woodland has been greatly reduced in the locality. The current known extent within 1,000 ha is 31.23 ha and 10,000 ha is 281.25 ha                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>(e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Estimated total extent of Cumberland Plain Woodland (PCT 849 & PCT 850) within the Sydney Basin Bioregion has been identified to be 11,200 ha (Office of Environment and Heritage 2019a). Within the Cumberland subregion the current extent of Cumberland Plain Woodland is <11,200. Given the exiting small patch sizes within the project and highly urbanised surrounding environment, the project is unlikely to result in a substantial reduction in extent and overall condition of Cumberland Plain Woodland at the subregion level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <i>(f) an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Within Sydney Basin a total extent of 11,200 ha of vegetation determined to be Cumberland Plain Woodland (PCT 849 & PCT 850) has been estimated by Office of Environment and heritage (2016). Examples of reserves include Scheyville National Park, Windsor Downs Nature Reserve, Leacock Regional Park and Mulgoa Nature Reserve.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><i>(g) the development, clearing or biodiversity certification proposal's impact on:</i></p> <p><i>(i) abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns</i></p> <p><i>(ii) characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants</i></p> <p><i>(iii) the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other</i></p> | <p>The Cumberland Plain Woodland recorded within the subject land occurs Moderate condition, Poor condition and as regrowth due to weed invasion and past-clearing.</p> <p>The linear strips recorded within the subject land are subject to ongoing disturbances such as edge effects associated with activities with the site's former business park and rural residential land uses and Sydney Metro infrastructure works have resulted in large areas of disturbance and vegetation clearance adjacent to the project, which in-turn reduces the TECs overall biodiversity value and limits the successful pollination and regeneration of flora species therein.</p> <p>It is assumed that the project is unlikely to result in substantial alteration of surface water flows or groundwater levels, fire or flooding regimes, this will be confirmed during detailed design phase. The project would not include use of fertilisers or other pollutants which would inhibit or impact the community. Mitigation measures have been provided (Section 10) to minimise any potential indirect impacts to remaining areas of the community.</p> |

| ASSESSMENT REQUIREMENT                                                                                     | CUMBERLAND PLAIN WOODLAND                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>chemicals or pollutants which may harm or inhibit growth of species in the potential TEC</i>            |                                                                                                                                                                                                                                                                                                                                                                                                             |
| <i>(h) direct or indirect fragmentation and isolation of an important area of the potential TEC</i>        | Within the subject land, this community currently occurs in moderate and poor condition. The project will impact on small patch areas that are currently subject to high edge area ratios, it is not assessed to be habitat that would be important for the long-term survival of Cumberland Plain Woodland. The project would not significantly increase fragmentation of the community within the region. |
| <i>(i) the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.</i> | The project biodiversity offset obligations will require like for like Cumberland Plain Woodland offsets. These offsets will be sourced either through the purchase of biodiversity credits or payment in to the Biodiversity Offset Fund. This biodiversity offset obligation will contribute to the recovery of the potential TEC in the IBRA subregion.                                                  |

## 9.5.2 THREATENED SPECIES

No SAI to threatened species entities under the BC Act will be impacted by the project.







## 9.6 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Impacts on Matters of National Environmental Significance (MNES) listed under the EPBC Act are summarised in the sections below.

### 9.6.1 COMMONWEALTH THREATENED ECOLOGICAL COMMUNITIES

One threatened ecological community listed under the EPBC Act was recorded within the development footprint. This community is:

- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community.

An assessment of the project impacts on this community was undertaken in accordance with the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Appendix E) and a summary of the outcome is provided in Table 9.7.

Table 9.7 Summary of significant impact on nationally threatened ecological communities

| SCIENTIFIC NAME                                                                                 | EPBC LISTING <sup>1</sup> | SIGNIFICANT IMPACT?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community</i> | CE                        | <b>No</b> - The development footprint will impact on up to 0.37 ha of Cumberland Plain Woodland which is consistent with the EPBC Act listing. Given the relatively small extent of Cumberland Plain Woodland that will be affected by the project (about 12,000 hectares remain in the Sydney Basin (Department of the Environment and Energy 2019c)) and that much of the impacted vegetation is isolated and in small patch sizes, the impact of the project on this community is unlikely to be significant. |

(1) Listed under the EPBC Act - CE = Critically Endangered

### 9.6.2 COMMONWEALTH LISTED THREATENED SPECIES

A total of two EPBC Act listed threatened species are considered to have a moderate or higher likelihood of occurring within the subject land based on the availability of habitat, these include:

- Swift Parrot
- Grey-headed Flying-fox

Assessments for each species was done in accordance with the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (Appendix E) and a summary of the outcomes of these are provided in Table 9.8.

Given the project is considered unlikely to have a significant impact on these species, a referral of this project to the Department of the Environment and Energy is not warranted.

Table 9.8 Summary of significant impact on nationally threatened fauna

| SCIENTIFIC NAME          | COMMON NAME  | EPBC LISTING <sup>1</sup> | SIGNIFICANT IMPACT?                                                                                                                                                                                                                                              |
|--------------------------|--------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Lathamus discolor</i> | Swift Parrot | CE                        | <b>No</b> - the project is considered unlikely to have a significant impact on the species. The removal of 1.85 ha of vegetation, which contains varying abundance of the blossom trees that the species would intermittently utilise during seasonal movements, |

| SCIENTIFIC NAME               | COMMON NAME            | EPBC LISTING <sup>1</sup> | SIGNIFICANT IMPACT?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------|------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               |                        |                           | does not comprises a significant proportion of foraging habitat available to the species in the surrounding locality. In addition, the species does not breed in NSW and therefore no breeding habitat would be impacted due to the project.                                                                                                                                                                                                                                                                                                                            |
| <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox | V                         | <b>No</b> - the project is considered unlikely to have a significant impact on the Grey-Headed Flying-Fox. The removal of 1.985 ha of vegetation, which contains varying abundance of the blossom and fruit trees that form part of the Grey-headed Flying-Fox diet, does not comprise a significant proportion of foraging habitat available to the species in the surrounding locality. No roosting camps were identified within the subject land, nor any within proximity to the development footprint, thus no roosting camps will be impacted due to the project. |

(1) Listed under the EPBC Act - CE = Critically Endangered, V= Vulnerable

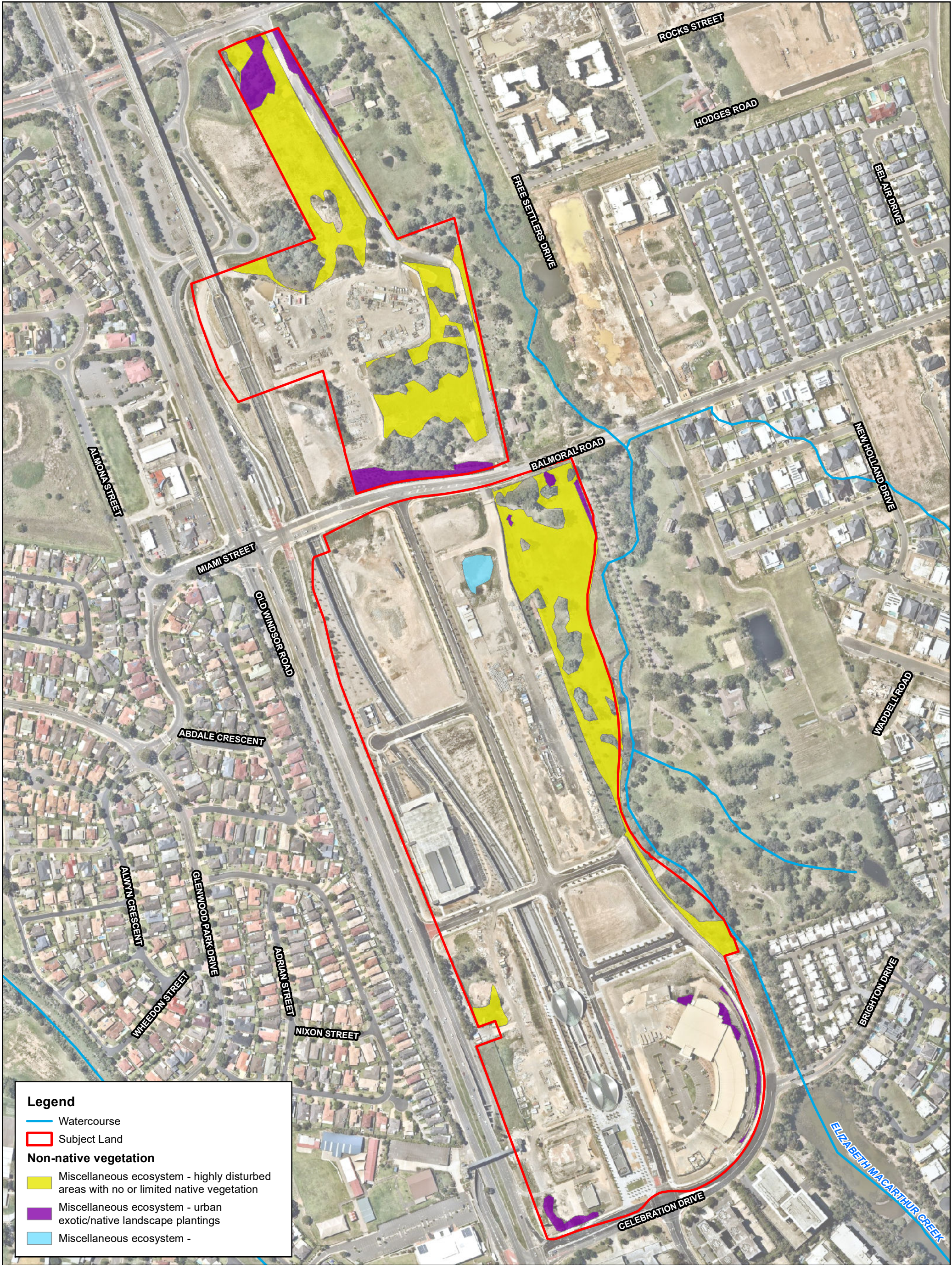


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## 9.7 IMPACTS NOT REQUIRING ASSESSMENT

In accordance with section 10.4 of the BAM, assessment and offsetting is not required for areas that do not contain native vegetation or provide habitat for threatened species. Within the subject land, these areas correspond to non-native vegetation types and have been shown on Figure 9.3.







# 10 MITIGATION AND MANAGEMENT MEASURES

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## 10.1 ENVIRONMENTAL SAFEGUARDS

To address the potential impacts of the proposal on biodiversity as discussed in Section 9, mitigation and management measures have been developed and are outlined in Table 10.1. Each measure has been assigned approximate timing which related to the stage of the project and responsibility as per section 9.3.1.2 of the BAM. Each measure outlined would be implemented as part of any Construction Environmental Management Plan (CEMP) for the site. Mitigation measures specific to the riparian assessment are provided in Appendix F.

Table 10.1 Recommended mitigation and management measures

| POTENTIAL IMPACT                                                                                                                                                             | MITIGATION MEASURES                                                                                                                                                                                                                                                                                                                                                                                             | PRE-<br>CONSTRUCTION | CONSTRUCTION | OPERATION | TIMING                           | RESPONSIBILITY                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|-----------|----------------------------------|-------------------------------------|
| Direct impact to native vegetation and habitat:<br>— Removal of hollow bearing trees and other habitat features during construction<br>— Injury or death during construction | Hollow-bearing trees are to be preserved where possible during detailed design.                                                                                                                                                                                                                                                                                                                                 | ✓                    |              |           | During detailed design           | Project manager / Project ecologist |
|                                                                                                                                                                              | Timing works to avoid critical life cycle events such as breeding or nursing                                                                                                                                                                                                                                                                                                                                    | ✓                    | ✓            |           | Prior to construction            | Project manager                     |
|                                                                                                                                                                              | Implement clearing protocols, including:<br>— marking trees to be removed and preparing an inventory of trees and hollows to be removed<br>— check hollow-bearing trees for the presence of bird nests and arboreal mammals, such as possums and bats; prior to felling<br>— animals found to be occupying trees should be safely removed before clearing of trees and relocated into nearby conservation lands |                      | ✓            |           | Prior to and during construction | Project manager / Project ecologist |
|                                                                                                                                                                              | The presence of a trained ecological or licensed wildlife handler during clearing events to relocate any displaced fauna to nearby habitat.                                                                                                                                                                                                                                                                     |                      | ✓            |           | During construction              | Project manager / Project ecologist |
|                                                                                                                                                                              | Relocation of habitat features (fallen timber, hollow logs) from within the development site into areas identified for retention                                                                                                                                                                                                                                                                                | ✓                    |              |           | During construction              | Project manager                     |



| POTENTIAL IMPACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | MITIGATION MEASURES                                                                                                                                                                                                                                             | PRE-<br>CONSTRUCTION | CONSTRUCTION | OPERATION | TIMING                                                   | RESPONSIBILITY                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|-----------|----------------------------------------------------------|-------------------------------------|
| <p>Indirect impact to native vegetation and habitat:</p> <ul style="list-style-type: none"> <li>— Disruption to established home range</li> <li>— Disruption to connections between suitable habitat for foraging and dispersal</li> <li>— Reduced viability of habitat due to edge effects</li> <li>— Transport of weeds to adjacent vegetation/habitat</li> <li>— Transport of pathogens to adjacent vegetation/habitat</li> <li>— Reduced viability of adjacent habitat due to noise, dust or light spill</li> <li>— Loss of breeding habitat</li> </ul> | <p>Implement clearing protocols including:</p> <ul style="list-style-type: none"> <li>— identify vegetation to be retained to prevent inadvertent damage</li> <li>— reduce soil disturbance</li> </ul>                                                          |                      | ✓            |           | Prior to and during construction                         | Project manager / Project ecologist |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Adaptive dust monitoring programs to control air quality                                                                                                                                                                                                        | ✓                    | ✓            |           | Prior to and during construction                         | Project manager                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas                                                                                                                                                       | ✓                    | ✓            |           | Prior to and during construction                         | Project manager                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Lighting associated with the project is to be designed in general accordance with Australian Standards and minimise light spill to adjacent riparian vegetation/habitat within Elizabeth Macarthur Creek.                                                       | ✓                    | ✓            | ✓         | Prior to construction, during construction and operation | Project manager / Project ecologist |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting | ✓                    | ✓            |           | Prior to and during construction                         | Project manager                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise                                                                                                                                                   |                      | ✓            | ✓         | Prior to construction and operation                      | Project manager                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                 |                      |              |           |                                                          |                                     |

| POTENTIAL IMPACT | MITIGATION MEASURES                                                                                                                                                                                                 | PRE-<br>CONSTRUCTION | CONSTRUCTION | OPERATION | TIMING                                  | RESPONSIBILITY                      |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------|-----------|-----------------------------------------|-------------------------------------|
|                  | Restrict compounds, carparking, equipment storage and stockpiling of resources to designated areas in cleared land.                                                                                                 |                      | ✓            |           | During detailed design and construction | Project manager                     |
|                  | Temporary fencing to protect significant environmental features such as riparian zones                                                                                                                              | ✓                    | ✓            |           | Prior to construction and operation     | Project manager                     |
|                  | Environmental inductions for all staff                                                                                                                                                                              | ✓                    | ✓            |           | Prior to construction and operation     | Project manager                     |
|                  | Nest boxes will be provided for any hollow bearing tree removed at a ratio of 2:1. Nest boxes are to be designed for microbat use and positioned in trees within Elizabeth Macarthur Creek.                         |                      | ✓            |           | Following construction                  | Project manager / Project ecologist |
|                  | Provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site (this may be through a Vegetation Management Plan) |                      | ✓            |           | Following construction                  | Project manager / Project ecologist |
|                  | Fencing or other measures to control animal and vehicle interactions                                                                                                                                                |                      | ✓            | ✓         | Following construction and operation    | Project manager / Project ecologist |



## 10.2 RISK ASSESSMENT

This section addresses section 9.3 of the BAM. Any residual impacts likely to remain after the mitigation measures are applied have been evaluated for risk and consequence using the criteria provided in Figure 10.1 and defined in Table 10.2.

The risk assessment for residual impacts is provided in Table 10.3. This outlines that the mitigation measures recommended reduced the risk from High and Moderate to Low.

Residual impacts are addressed in section 11.

| CONSEQUENCES | ALMOST CERTAIN | LIKELY   | MODERATE<br>LIKELIHOOD | UNLIKELY | RARE     |
|--------------|----------------|----------|------------------------|----------|----------|
| 1            | Critical       | Critical | High                   | High     | Moderate |
| 2            | Critical       | High     | High                   | Moderate | Moderate |
| 3            | High           | High     | Moderate               | Low      | Low      |
| 4            | High           | Moderate | Low                    | Low      | Low      |
| 5            | Moderate       | Low      | Low                    | Low      | Low      |

Figure 10.1 Risk matrix

Table 10.2 Definition of consequences

| CONSEQUENCE | DEFINITION                                                                                                                                                           |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5           | Intense local impacts with long term effects and/or major potential for irreversible widespread impacts. Severe impact on ecosystem. Regulatory intervention likely. |
| 4           | Major local impacts with short term effects. Environmental harm caused.                                                                                              |
| 3           | Moderate impacts with medium term effects. Sensitive environmental features which may be rehabilitated with difficulty.                                              |
| 2           | Minor local impacts with short term effects. Easily rehabilitated.                                                                                                   |
| 1           | Minor impact with negligible effects                                                                                                                                 |

Table 10.3 Risk assessment

| POTENTIAL IMPACT                                                               | PROJECT PHASE            | RISK BEFORE MITIGATION |             |          | RISK AFTER MITIGATION |             |      |
|--------------------------------------------------------------------------------|--------------------------|------------------------|-------------|----------|-----------------------|-------------|------|
|                                                                                |                          | CONSEQUENCE            | PROBABILITY | RISK     | CONSEQUENCE           | PROBABILITY | RISK |
| Direct impacts                                                                 |                          |                        |             |          |                       |             |      |
| Removal of hollow bearing trees and other habitat features during construction | Construction             | 2                      | Moderate    | High     | 3                     | Rare        | Low  |
| Injury or death during construction                                            | Construction             | 2                      | Moderate    | High     | 3                     | Rare        | Low  |
| Indirect impacts                                                               |                          |                        |             |          |                       |             |      |
| Disruption to established home range                                           | Construction / Operation | 2                      | Moderate    | High     | 3                     | Rare        | Low  |
| Disruption to connections between suitable habitat for foraging and dispersal  | Construction / Operation | 2                      | Moderate    | High     | 3                     | Rare        | Low  |
| Reduce viability of adjacent habitat due to edge effects                       | Construction             | 3                      | Likely      | High     | 3                     | Rare        | Low  |
| Transport of weeds from the site to adjacent vegetation                        | Construction             | 3                      | Likely      | High     | 3                     | Rare        | Low  |
| Transport of pathogens from the site to adjacent vegetation                    | Construction             | 2                      | Unlikely    | Moderate | 3                     | Rare        | Low  |
| Reduced viability of adjacent habitat due to noise, dust or light spill        | Construction / Operation | 2                      | Moderate    | High     | 4                     | Rare        | Low  |
| Loss of breeding habitat                                                       | Construction / Operation | 2                      | Moderate    | High     | 3                     | Rare        | Low  |



# 11 BIODIVERSITY OFFSETTING

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## 11.1 BC ACT - OFFSET FOR AFFECTED THREATENED BIOTA

Biodiversity offsetting for residual impacts on BC Act biodiversity values is mandatory for Part 4 and SSD developments being assessed under Part 7 of the BC Act and subject to a BDAR. Biodiversity offset obligations have been determined using the BAM credit calculator (Appendix D).

### 11.1.1 IMPACTS NOT REQUIRING OFFSET

As all vegetation zones generated a VI score of  $\geq 17$ , biodiversity offsets are required for all impacts to native vegetation and habitat for threatened species. Impacts which require offsetting have been shown on Figure 11.1 with the required ecosystem and species credit obligations outlined below.

### 11.1.2 ECOSYSTEM CREDITS

The required ecosystem credit obligation, as determined using the BAM calculator, for the project are provided in Table 11.1

Table 11.1 Ecosystem credits required to offset project impacts

| PLANT<br>COMMUNITY<br>TYPE (PCT)                                                                                              | VEGETATION<br>ZONE | THREATENED<br>ECOLOGICAL<br>COMMUNITY                                                                                               | SENSITIVITY<br>TO LOSS | BIODIVERSITY<br>RISK<br>WEIGHTING | CURRENT VI<br>SCORE | FUTURE VI<br>SCORE | CHANGE IN<br>VI SCORE | AREA<br>IMPACTED<br>(HA) | ECOSYSTEM<br>CREDIT<br>OBLIGATION |
|-------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------|---------------------|--------------------|-----------------------|--------------------------|-----------------------------------|
| PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion | VZ1 – Poor         | River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | High                   | 2.00                              | 48.1                | 0.0                | -48.1                 | 0.06                     | 1                                 |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion                    | VZ2 - Moderate     | Cumberland Plain Woodland in the Sydney Basin Bioregion                                                                             | Very High              | 2.50                              | 67.9                | 0.0                | -67.9                 | 0.75                     | 32                                |
|                                                                                                                               | VZ3 - Poor         |                                                                                                                                     |                        | 2.50                              | 31.5                | 0.0                | -31.5                 | 1.04                     | 20                                |
| Total                                                                                                                         |                    |                                                                                                                                     |                        |                                   |                     |                    |                       | 1.85                     | 53                                |



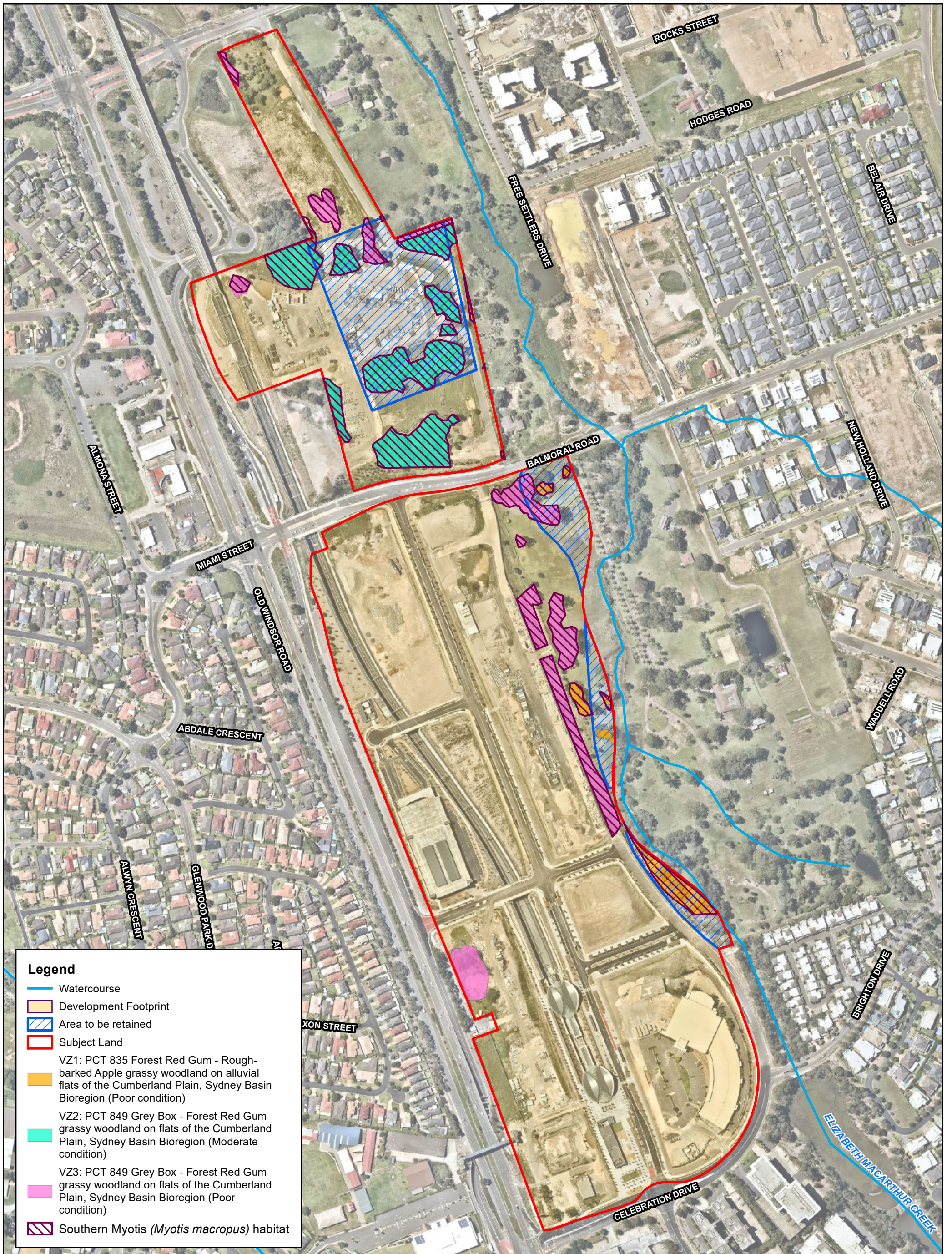
### 11.1.3 SPECIES CREDITS

The required species credit obligation, as determined using the BAM calculator, for the project are provided in Table 11.2.

Table 11.2 Species credits required to offset project impacts

| SCIENTIFIC NAME        | COMMON NAME     | SENSITIVITY TO LOSS | BIODIVERSITY RISK WEIGHTING | VEGETATION ZONE | AREA IMPACTED (HA) | SPECIES CREDIT OBLIGATION |
|------------------------|-----------------|---------------------|-----------------------------|-----------------|--------------------|---------------------------|
| <i>Myotis macropus</i> | Southern Myotis | Moderate            | 2.00                        | VZ1 – Poor      | 0.06               | 1                         |
|                        |                 |                     |                             | VZ2 - Moderate  | 0.75               | 25                        |
|                        |                 |                     |                             | VZ3 - Poor      | 0.79               | 12                        |
| Total                  |                 |                     |                             |                 | 1.60               | 38                        |





Legend

Watercourse

Development Footprint

Area to be retained

Subject Land

VZ1: PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition)

VZ2: PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition)

VZ3: PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition)

Southern Myotis (*Myotis macropus*) habitat

Map: BellaVista\_GIS\_022\_A3

Date: 7/10/2020

Data source: Metromap 2019

Author: R.Suansri

Approved by: J.E

050100150

m

1:4,000

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

wsp

Landcom

Bella Vista Station Precinct

Figure 11.1

Impacts requiring offsetting

www.wsp.com



#### 11.1.4 OFFSETTING STRATEGY

The biodiversity offset strategy for this project, that will enable the credit obligations to be met, comprises two options. These options are, the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register or through making a payment into the Biodiversity Conservation Fund.

##### 11.1.4.1 EXISTING BIODIVERSITY CREDITS

The purchase and retirement of existing biodiversity credits is required to be undertaken based on like for like trading rules as outlined under the *Biodiversity Conservation Regulation 2017* and as identified by the BAM calculator output for the project (Appendix D). The like for like ecosystem credit class options for each biodiversity offset credit obligation is summarised in Table 11.3.

Table 11.3 Like for like trading ecosystem credit classes

| CREDIT CLASS PCT                                                                                                              | ANY PCT WITH THE BELOW TEC                                                                                                                                                                                                                                                                           | CONTAINING HBT | IN THE BELOW IBRA SUBREGIONS                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion | River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (including PCT's 686, 828, 835, 839, 941, 971, 1064, 1108, 1109, 1212, 1228, 1232, 1293, 1318, 1326, 1386, 1522, 1556, 1594, 1618, 1646, 1648, 1720, 1794, 1800) | Yes            | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion                    | Cumberland Plain Woodland in the Sydney Basin Bioregion (including PCT's 849, 850)                                                                                                                                                                                                                   | Yes            | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

Source: Like for like trading credit classes as per the BAM credit report (Appendix D)

In relation to like for like species credit trading options, the offset must be for Southern Myotis (*Myotis macropus*) species credits that can be sourced from anywhere in NSW.

##### 11.1.4.2 PAYMENT INTO THE BIODIVERSITY CONSERVATION FUND

Payments for the project offset obligations could be paid into the Biodiversity Conservation Fund although it should be noted that payment for offsets are subject to change and that credit payment prices are reviewed quarterly.

#### 11.1.5 EPBC ACT – OFFSET FOR AFFECTED THREATENED BIOTA

The project will not result in a significant impact on any Matters of National Environmental Significance and as such the project will not require an environmental offset under the EPBC Act.

## 12 CONCLUSION

The Bella Vista Station Precinct spans alignment of the SMNW corridor that consists of an approximate 1.4 km stretch of government owned land, extending from Celebration Drive in the south to Memorial Avenue in the north and generally bound by Old Windsor Road and existing private land holdings to the west and Elizabeth Macarthur Creek to the east.

The project will have a residual impact on 1.85 ha of native vegetation within the development footprint comprising two native plant community types:

- PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial 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

Detail field surveys were completed in accordance with the BAM and relevant survey guidelines and have identified two threatened ecological communities listed under the BC Act and or EPBC Act within the subject land. These are:

- Cumberland Plain Woodland in the Sydney Basin Bioregion
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

No threatened flora species have been recorded or are considered affected by the project.

One candidate threatened fauna species, Southern Myotis, has been assumed present based on available habitat attributes. A total of 1.60 ha of habitat will be impacted for this species.

One SAII entity, Cumberland Plain Woodland, will be impacted because of the project. The impacts on this community have been reduced to 0.75 ha of moderate condition and 1.04 of poor condition vegetation. Given the small patch sizes, highly modified and fragmented nature of the vegetation type within the development footprint, the project impact on the threatened ecological community is unlikely to lead to a serious and irreversible impact.

The standard biodiversity mitigation measures will be implemented to avoid and minimise the impact of the project.

The BAM Credit Calculator was used to provide a calculation of the number and class of biodiversity credits required to offset the biodiversity impacts associated with the proposal to ensure maintenance or improvement in biodiversity. The proposal will require a total of 53 of ecosystem credits and 38 species credits.

Assessments of impact significance in accordance with the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance were conducted for all Matters of National Environmental Significance (MNES) threatened species, populations and ecological communities considered likely to be affected by the proposal. Through these assessments, it was concluded that the project is unlikely to have a significant impact on any threatened species, population or ecological community, as such, a referral of this proposal under the EPBC Act is not required.



# 13 LIMITATIONS

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## 13.1 SCOPE OF SERVICES

This biodiversity impact assessment report (the report) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

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## 13.2 RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

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## 13.3 ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

On all sites, varying degrees of non-uniformity of the vertical and horizontal soil or groundwater conditions are encountered. Hence no monitoring, common testing or sampling technique can eliminate the possibility that monitoring or testing results/samples are not totally representative of soil and/or groundwater conditions encountered. The conclusions are based upon the data and the environmental field monitoring and/or testing and are therefore merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of contaminants or emissions. Also, it should be recognised that site conditions, including the extent and concentration of contaminants, can change with time.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

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## 13.4 REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client (and no other party), but may be relied upon by the Environment Protection Authority acting in its capacity as the administering authority (as defined in the Environmental Protection Act 1994 (QLD) (EP Act). WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Except as provided below parties other than the client should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

The Environment Protection Authority in its capacity as the administering authority (as defined in the EP Act) may consider and rely upon the report for the purposes of making a decision under Section 396 of the EP Act and for the administration of matters under and in accordance with that section.

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## 13.5 OTHER LIMITATIONS

WSP will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.



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# APPENDIX A

## LIKELIHOOD OF OCCURRENCE OF THREATENED FLORA



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# **A1    LIKELIHOOD OF OCCURRENCE OF THREATENED FLORA**



| SCIENTIFIC NAME         | COMMON NAME     | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                       | BIONET RECORDS | SOURCE <sup>4</sup>     | LIKELIHOOD OF OCCURRENCE                                                                                                           |
|-------------------------|-----------------|----------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <i>Acacia bynoeana</i>  | Bynoe's Wattle  | E                          | V                            | Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.<br><br>Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple. | 2              | BAC;<br>BioNet;<br>PMST | Low. Preferred habitat in the form of sandy soils, not recorded within the subject land.                                           |
| <i>Acacia gordonii</i>  | Acacia gordonii | E                          | E                            | Occurs in the lower Blue Mountains from Bilpin to Faulconbridge and also in the Glenorie district. Grows on sandstone outcrops and amongst rock platforms in dry sclerophyll forest and heath. Specifically this species occurs in Sydney Sandstone Ridgetop Communities.                                                                  | 0              | PMST                    | Low. Preferred habitat, Sandstone Ridgetops, not recorded within the subject land.                                                 |
| <i>Acacia pubescens</i> | Downy Wattle    | V                          | V                            | Restricted to the Sydney Region from Bilpin to the Georges River and also at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically it occurs at the intergrade between shales and sandstones in gravelly soils often with ironstones.                                                           | 14             | BAC;<br>BioNet;<br>PMST | Moderate. Preferred clay soils recorded. Species is known to occur within locality. Candidate species subject to targeted surveys. |

| SCIENTIFIC NAME                 | COMMON NAME              | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                  |
|---------------------------------|--------------------------|----------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Allocasuarina glareicola</i> | Allocasuarina glareicola | E                          | E                            | Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows on lateritic soil in open forest.                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0              | PMST                | Low. Preferred habitat, lateritic soils, not recorded within the subject land.                                                                                                            |
| <i>Asterolasia elegans</i>      | Asterolasia elegans      | E                          | E                            | Known from only seven populations, north of Sydney in the Baulkham Hills, Hawkesbury and Hornsby LGAs; also likely to occur in the western part of Gosford LGA. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine ( <i>Syncarpia glomulifera subsp. glomulifera</i> ), Smooth-barked Apple ( <i>Angophora costata</i> ), Sydney Peppermint ( <i>Eucalyptus piperita</i> ), Forest Oak ( <i>Allocasuarina torulosa</i> ) and Christmas Bush <i>Ceratopetalum gummiferum</i> . | 0              | PMST                | Low. Preferred habitat, Hawkesbury sandstone sheltered forests, not recorded within the subject land.                                                                                     |
| <i>Caladenia tessellata</i>     | Thick Lip Spider Orchid  | E                          | V                            | Occurs south of Swansea where it grows on clay loam or sandy soils. Prefers low open forest with a heathy or sometimes grassy understorey. Within NSW, currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Previously known also from Sydney and South Coast areas.                                                                                                                                                                                                                                                  | 0              | BAC; PMST           | Low. Though marginal habitat in the form of moderate condition grassy sclerophyll woodland (PCT 849) recorded within the subject land, the species is not known to occur within locality. |



| SCIENTIFIC NAME                  | COMMON NAME              | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                        |
|----------------------------------|--------------------------|----------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|-----------------------------------------------------------------------------------------------------------------|
| <i>Callistemon linearifolius</i> | Netted Bottle Brush      | V                          | Not listed                   | Occurs chiefly from Georges to the Hawkesbury River where it grows in dry sclerophyll forest, open forest, scrubland or woodland on sandstone. Found in damp places, usually in gullies. Within the Sydney region, recent records are limited to the Hornsby Plateau area near the Hawkesbury River.                                                                                                                                                                                                                                                           | 1              | BAC; BioNet         | Low. Preferred habitat in the form of sandstone geologies not recorded within the subject land.                 |
| <i>Commersonia prostrata</i>     | Dwarf Kerrawang          | E                          | E                            | Occurs on sandy, sometimes peaty soils in a wide variety of habitats: Snow Gum ( <i>Eucalyptus pauciflora</i> ) Woodland and Ephemeral Wetland floor at Rows Lagoon; Blue leaved Stringybark ( <i>E. agglomerata</i> ) Open Forest at Tallong; and in Brittle Gum ( <i>E. mannifera</i> ) Low Open Woodland at Penrose; Scribbly Gum ( <i>E. haemostoma</i> ) Swamp Mahogany ( <i>E. robusta</i> ) Ecotonal Forest at Tomago. Associated native species may include <i>Imperata cylindrica</i> , <i>Empodisma minus</i> and <i>Leptospermum continentale</i> . | 0              | BAC                 | Low. Subject land provides generally unsuitable habitat.                                                        |
| <i>Cryptostylis hunteriana</i>   | Leafless Tongue Orchid   | V                          | V                            | Occurs south from the Gibraltar Range, chiefly in coastal districts but also extends on to tablelands. Grows in swamp-heath and drier forest on sandy soils on granite & sandstone. Occurs in small, localised colonies most often on the flat plains close to the coast but also known from some mountainous areas growing in moist depressions and swampy habitats.                                                                                                                                                                                          | 0              | PMST                | Low. Preferred habitat in the form of swamp-heath and sandstone geologies not recorded within the subject land. |
| <i>Cynanchum elegans</i>         | White-flowered Wax Plant | E                          | E                            | Occurs from the Gloucester district to the Wollongong area and inland to Mt Dangar where it grows in rainforest gullies, scrub and scree slopes. This species typically occurs at the ecotone between dry subtropical forest/woodland communities.                                                                                                                                                                                                                                                                                                             | 0              | BAC; PMST           | Low. Preferred habitat, rainforest gullies, scrub and scree slopes, not recorded within the subject land.       |

| SCIENTIFIC NAME             | COMMON NAME          | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                           |
|-----------------------------|----------------------|----------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <i>Darwinia biflora</i>     | Darwinia biflora     | V                          | V                            | Occurs from Cheltenham to Hawkesbury River where it grows in heath on sandstone or in the understorey of woodland on shale-capped ridges. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include <i>Eucalyptus haemastoma</i> , <i>Corymbia gummifera</i> and/or <i>E. squamosa</i> . The vegetation structure is usually woodland, open forest or scrub-heath.                                                                                                  | 94             | BioNet; PMST        | Low. Preferred habitat in the form of sandstone geologies and shale-capped sandy soils not recorded within the subject land.       |
| <i>Deyeuxia appressa</i>    | Deyeuxia appressa    | E                          | E                            | Highly restricted, known only from two pre-1942 records in the Sydney area; in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown and in 1941 from Killara, near Hornsby. It has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas. Flowers spring to summer and is mesophytic (grows in moist conditions). But, given that it hasn't been seen in over 60 years, almost nothing is known of the species' habitat and ecology. | 0              | BAC                 | Low. Species is considered extinct in the wild.                                                                                    |
| <i>Dillwynia tenuifolia</i> | Dillwynia tenuifolia | V                          | Not listed                   | Occurs on the Cumberland Plain from the Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite. Specifically, occurs within Castlereagh woodlands, particularly in shale gravel transition forest. Associated species include <i>Eucalyptus fibrosa</i> , <i>E. sclerophylla</i> , <i>Melaleuca decora</i> , <i>Daviesia ulicifolia</i> , <i>Dillwynia juniperina</i> and <i>Allocasuarina littoralis</i> .                                                                                     | 0              | BAC                 | Low. Associated vegetation communities not recorded within subject land, species has not been previously recorded within locality. |



| SCIENTIFIC NAME                                      | COMMON NAME                            | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                                  |
|------------------------------------------------------|----------------------------------------|----------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Dillwynia tenuifolia</i> - endangered population  | Dillwynia tenuifolia, Kemps Creek      | E2                         | Not listed                   | This populations occupancy area is bounded by western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0              | BAC                 | Low. The subject land is outside of the populations distribution                                                                                                          |
| <i>Epacris purpurascens</i> var. <i>purpurascens</i> | Epacris purpurascens var. purpurascens | V                          | Not listed                   | Occurs in Gosford and Sydney districts where it grows in sclerophyll forest, scrub and swamps. Usually found in sites with a strong shale influence.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 61             | BioNet              | Low. Preferred habitat, soils with a strong shale influence, not recorded within the subject land.                                                                        |
| <i>Eucalyptus benthamii</i>                          | Camden White Gum                       | V                          | V                            | Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment. Recruitment of juveniles appears to be most successful on bare silt deposits in rivers and streams. Occurs in open forest. Associated species at the Bents Basin site include <i>Eucalyptus elata</i> , <i>E. bauerina</i> , <i>E. amplifolia</i> , <i>E. deanei</i> and <i>Angophora subvelutina</i> . Understorey species include <i>Bursaria spinosa</i> , <i>Pteridium esculentum</i> and a wide variety of agricultural weeds. The Kedumba Valley site lists <i>E. crebra</i> , <i>E. deanei</i> , <i>E. punctata</i> , <i>Leptospermum flavescens</i> , <i>Acacia filicifolia</i> and <i>Pteridium esculentum</i> among its associated species. | 0              | BAC                 | Low. Marginal habitat recorded, associated vegetation was recorded in moderate condition with high exotic foliage cover. The subject land is unlikely to support species. |

| SCIENTIFIC NAME              | COMMON NAME                    | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                             |
|------------------------------|--------------------------------|----------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Eucalyptus camfieldii</i> | Heart-leaved Stringybark       | V                          | V                            | Occurs in scattered locations within a restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Grows in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone, in coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include Brown Stringybark ( <i>E. capitellata</i> ), Scribbly Gum ( <i>E. haemastoma</i> ), Narrow-leaved Stringybark ( <i>E. oblonga</i> ), Silvertop Ash ( <i>E. sieberi</i> ), Smooth-barked Apple ( <i>Angophora costata</i> ), Dwarf Apple ( <i>A. hispida</i> ), Red Bloodwood ( <i>Corymbia gummifera</i> ), Scrub She-oak ( <i>Allocasuarina distyla</i> ), Slender Tea Tree ( <i>Leptospermum trinervium</i> ), and Fern-leaved Banksia ( <i>Banksia oblongifolia</i> ). | 0              | PMST                | Low. Preferred habitat, shallow sandy soils, not recorded within the subject land.                                                                                   |
| <i>Eucalyptus nicholii</i>   | Narrow-leaved Black Peppermint | V                          | V                            | Occurs from Niangala to Glenn Innes where it grows in grassy sclerophyll woodland on shallow relatively infertile soils on shales and slates, mainly on granite. Endemic on the NSW Northern Tablelands, of limited occurrence, particularly in the area from Walcha to Glen Innes; often on porphyry or granite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 2              | BioNet              | None. Subject land is outside of species known distribution. This species was recorded as a planted specimen and is not considered to form a species credit species. |

| SCIENTIFIC NAME                               | COMMON NAME              | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                      |
|-----------------------------------------------|--------------------------|----------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|---------------------------------------------------------------------------------------------------------------|
| <i>Eucalyptus sp. Cattai</i>                  | Eucalyptus sp. Cattai    | CE                         | CE                           | Occurs in the area between Colo Heights and Castle Hill in north-western Sydney, with historical records from central Sydney. It grows as an emergent tree in scrub, heath and low woodland on sandy soils, generally on flat ridge tops. It usually occurs as isolated individuals or occasionally in small clustered groups. Associated soils are laterised clays overlying sandstone.                                                                                                                                              | 53             | BioNet; PMST        | Low. Preferred habitat, sandy soils on ridgetops, not recorded within the subject land.                       |
| <i>Genoplesium baueri</i>                     | Bauers Midge Orchid      | V                          | E                            | Grows in dry sclerophyll forest and moss gardens over sandstone. The species has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from northern Sydney suburbs. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. | 0              | PMST                | Low. Preferred habitat, sandstone geology, not recorded within the subject land.                              |
| <i>Grevillea juniperina subsp. juniperina</i> | Juniper-leaved Grevillea | V                          | Not listed                   | Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest.                                                         | 5              | BAC; BioNet         | Moderate. Associated habitat recorded within the subject land. Candidate species subject to targeted surveys. |



| SCIENTIFIC NAME                                | COMMON NAME                             | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                                            |
|------------------------------------------------|-----------------------------------------|----------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Gyrostemon thesioides</i>                   | Gyrostemon thesioides                   | E                          | Not listed                   | Confined to the Georges and Nepean Rivers where it occurs on river banks. It is a fire-opportunist.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0              | BAC                 | Low. Preferred habitat not recorded within subject land.                                                                                                                            |
| <i>Haloragis exalata</i> subsp. <i>exalata</i> | Haloragis exalata subsp. <i>exalata</i> | V                          | V                            | Found in the south coast, central coast and north west slopes botanical regions where it appears to require protected and shaded damp situations in riparian habitats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0              | BAC; PMST           | Low. Elements of preferred habitat, creek banks within flood zone subject to human disturbance, recorded however, this species has one record (Parramatta) in the broader locality. |
| <i>Hibbertia</i> sp. Bankstown                 | <i>Hibbertia</i> sp. Bankstown          | CE                         | CE                           | The airport site is very heavily modified from the natural state, lacks canopy species and is currently a low grass/shrub association with many pasture grasses and other introduced herbaceous weeds. Soil at the site is a sandy (Tertiary) alluvium with a high silt content. The remnant at the site and soil type are consistent with an inferred pre-settlement cover of Castlereagh Ironbark Forest although some remnant vegetation at and near the site (along the channel in particular) suggests Castlereagh Scribbly Gum Woodland is equally valid. <i>Hibbertia</i> sp. Bankstown has been observed to flower from October to December, with seed setting from October to January. Most <i>Hibbertia</i> species are primarily pollinated by bees, but many have specialised mechanisms requiring particular bee species, beetles or syrphid flies. | 0              | BAC                 | Low. Subject land is outside of species known locality.                                                                                                                             |

| SCIENTIFIC NAME                               | COMMON NAME                            | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                                        |
|-----------------------------------------------|----------------------------------------|----------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Hibbertia superans</i>                     | Hibbertia superans                     | E                          | Not listed                   | Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites, and at one locality at Mount Boss, inland from Kempsey. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as trackside.                                                                                                                                                                                                                                   | 46             | BioNet              | Low. Preferred habitat, Sandstone Ridgetops, not recorded within the subject land.                                                                                                                                                              |
| <i>Isotoma fluviatilis subsp. fluviatilis</i> | Isotoma fluviatilis subsp. fluviatilis | Not listed                 | X                            | Currently known from only two adjacent sites on a single private property at Erskine Park in the Penrith LGA. Previous sightings are all from western Sydney, at Homebush and at Agnes Banks. Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain Woodland) ecotone.                                                                                                                                                                                                                 | 1              | BioNet, PMST        | Low. Though marginal habitat was recorded within the subject land, this species is considered extinct.                                                                                                                                          |
| <i>Leucopogon fletcheri subsp. fletcheri</i>  | Leucopogon fletcheri subsp. fletcheri  | E                          | Not listed                   | Restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains. Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Grows in dry eucalypt woodland or in shrubland on clay, lateritic soils or Hawkesbury sandstone. Found on sandstone ridges and upper slopes in heath or woodland, sometimes in or below sandstone-shale ecotone; often associated with lateritic soils with some clay influence. | 6              | BioNet              | Low. Although the appropriate geology was recorded within the subject land, this species local population is known to occur in Annangrove and Kenthurst where ridges and spurs occur as well as relatively large patches of remnant vegetation. |

| SCIENTIFIC NAME                                                                | COMMON NAME                                                                                                                                                                | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                      | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                               |
|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population | Marsdenia viridiflora R. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas | E2                         | Not listed                   | Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range. Grows in vine thickets and open shale woodland.                                                                                                                                                      | 0              | BAC                 | Moderate. Preferred habitat, open shale woodland, recorded within the subject land.                                                                    |
| <i>Maundia triglochinos</i>                                                    | Maundia triglochinos                                                                                                                                                       | V                          | Not listed                   | Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Associated with wetland species e.g. <i>Triglochin procerum</i> . | 0              | BAC                 | Low. The potential habitat recorded (PCT 1071) occurred in moderate condition with high exotic cover. The subject land is unlikely to support species. |
| <i>Melaleuca biconvexa</i>                                                     | Biconvex Paperbark                                                                                                                                                         | V                          | V                            | Occurs as disjunct populations in coastal New South Wales from Jervis Bay to Port Macquarie, with the main concentration of records is in the Gosford/Wyong area. Grows in damp places, often near streams, or low-lying areas on alluvial soils of low slopes or sheltered aspects.                                                      | 0              | BAC; PMST           | Low. Subject land does not provide suitable habitat.                                                                                                   |



| SCIENTIFIC NAME                    | COMMON NAME             | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                          |
|------------------------------------|-------------------------|----------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Micromyrtus minutiflora</i>     | Micromyrtus minutiflora | E                          | V                            | Restricted to the general area between Richmond and Penrith, western Sydney. Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0              | PMST                | Low. Preferred habitat, Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, not recorded within the subject land. |
| <i>Pelargonium sp. Striatellum</i> | Omeo Stork's-bill       | E                          | E                            | Known from only 4 locations in NSW, with three on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. The only other known population is at Lake Omeo, Victoria. It occurs at altitudes between 680 to 1030 m. It is known to occur in the local government areas of Goulburn-Mulwaree, Cooma-Monaro, and Snowy River, but may occur in other areas with suitable habitat; these may include Bombala, Eurobodalla, Palerang, Tumbarumba, Tumut, Upper Lachlan, and Yass Valley local government areas. It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities. It occurs with Serrated Tussock ( <i>Nassella trichotoma</i> ) and Curly Sedge ( <i>Carex bichenoviana</i> ), and less commonly with Creeping Hopbush ( <i>Dodonaea procumbens</i> ) and a bog-sedge ( <i>Schoenus nitens</i> ) on sandy soils or gravelly soils or amongst rocks. | 0              | PMST                | Low. Species is not known to occur within locality of the subject land.                                                                           |

| SCIENTIFIC NAME             | COMMON NAME   | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                      |
|-----------------------------|---------------|----------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|---------------------------------------------------------------------------------------------------------------|
| <i>Persicaria elatior</i>   | Tall Knotweed | V                          | V                            | Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.                                                                                                                                                                                                                                                                                                                                             | 0              | BAC                 | Low. Marginal habitat recorded within subject land. Species has not been previously recorded within locality. |
| <i>Persoonia bargoensis</i> | Bargo Geebung | E                          | V                            | The Bargo Geebung is restricted to a small area south-west of Sydney on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands. The historical limits are Picton and Douglas Park (northern), Yanderra (southern), Cataract River (eastern) and Thirlmere (western). The Bargo Geebung occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils of the Wianamatta Shale and Hawkesbury Sandstone. It favours interface soil landscapes such as between the Blacktown Soil Landscape and the complex Mittagong Formation soils (Lucas Heights Soil Landscape) with the underlying sandstone (Hawkesbury Soil Landscape and Gynea Soil Landscape). Some of the vegetation the species occurs within would be recognised as the Shale/Sandstone Transition Forest, a listed community. | 0              | BAC                 | Low. Preferred geologies not recorded within the subject land.                                                |

| SCIENTIFIC NAME          | COMMON NAME                                  | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BIONET RECORDS | SOURCE <sup>4</sup>     | LIKELIHOOD OF OCCURRENCE                                                                                                        |
|--------------------------|----------------------------------------------|----------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <i>Persoonia hirsuta</i> | Hairy Geebung                                | E                          | E                            | The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. It has a large area of occurrence, but occurs in small populations. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone or very rarely on shale. Often occurs in areas with clay influence, in the ecotone between shale and sandstone.                                                                                                                                                                                                                                                                                                                                | 15             | BAC;<br>BioNet;<br>PMST | Moderate. Preferred habitat, clay-based soils, recorded within the subject land. Candidate species subject to targeted surveys. |
| <i>Persoonia mollis</i>  | <i>Persoonia mollis</i> subsp. <i>maxima</i> | E                          | E                            | Restricted to the Hornsby Heights, Mt Colah area north of Sydney. It occurs on sheltered upper hillsides of narrow gullies of Hawkesbury sandstone characterised by steep sideslopes, rocky benches and broken scarps, with creeks fed by small streams and intermittent drainage depressions. It grows in moist, tall forest ( <i>Angophora costata</i> , <i>Eucalyptus piperita</i> , <i>Corymbia gummifera</i> ), often with warm temperate rainforest influences ( <i>Syncarpia glomulifera</i> , <i>Ceratopetalum apetalum</i> , <i>Callicoma serratifolia</i> ). Sometimes recorded in low densities on the dry upper-hillsides of gullies and in more exposed aspects in association with <i>E. haemastoma</i> and <i>E. punctata</i> . | 0              | PMST                    | Low. Subject land is outside of species known locality.                                                                         |



| SCIENTIFIC NAME                                  | COMMON NAME                        | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                               |
|--------------------------------------------------|------------------------------------|----------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Pilularia novae-hollandiae</i>                | Austral Pillwort                   | E                          | Not listed                   | In NSW, Austral Pillwort has been recorded from suburban Sydney, Khancoban, the Riverina between Albury and Urana (including Henty, Walbundrie, Balldale and Howlong), Oolambeyan National Park near Carathool and at Lake Cowal near West Wyalong. The populations at Lake Cowal and Oolambeyan NP are the only known extant populations in NSW, although the species is obscure and has possibly been overlooked elsewhere. The species has also been recorded in the Australian Capital Territory, Victoria, Tasmania, South Australia and Western Australia. Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. | 0              | BAC                 | Low. The potential habitat recorded (PCT 1071) occurred in moderate condition with high exotic cover. The subject land is unlikely to support species. |
| <i>Pimelea curviflora</i> var. <i>curviflora</i> | Pimelea curviflora var. curviflora | V                          | V                            | Confined to coastal areas around Sydney where it grows on sandstone and laterite soils. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville, but its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Usually occurs in woodland in the transition between shale and sandstone, often on Lucas Heights soil landscape.                                                                                                                                                                                                                                                                                              | 9              | BAC; BioNet; PMST   | Low. Preferred geologies not recorded within the subject land.                                                                                         |
| <i>Pimelea spicata</i>                           | Spiked Rice-flower                 | E                          | E                            | This species occurs in two disjunct areas: in coastal districts from Lansdowne to Shellharbour, and in Cumberland Plain Woodland inland to Penrith. In western Sydney it grows on Wianamatta Shales in Greybox - Ironbark Woodland with <i>Bursaria spinosa</i> and <i>Themeda triandra</i> . In the Illawarra, it occurs on well structured clay soils in grassland or open woodland.                                                                                                                                                                                                                                                                                                                                                   | 6              | BAC; BioNet; PMST   | Moderate. Suitable habitat recorded within the subject land. Candidate species subject to targeted surveys.                                            |

| SCIENTIFIC NAME             | COMMON NAME             | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                     |
|-----------------------------|-------------------------|----------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Pomaderris brunnea</i>   | Pomaderris brunnea      | V                          | V                            | Confined to the Colo and Upper Nepean Rivers where it grows in open forest; in western Sydney (Camden to Picton area) known from sandy alluvium on levee and creek banks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0              | BAC                 | Low. Subject land is outside of species known distribution. Sandy alluviums not recorded.                                                                                                                                    |
| <i>Pterostylis gibbosa</i>  | Illawarra Greenhood     | E                          | E                            | All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage.<br><br>In the Illawarra region, the species grows in woodland dominated by Forest Red Gum <i>Eucalyptus tereticornis</i> , Woollybutt <i>E. longifolia</i> and White Feather Honey-myrtle <i>Melaleuca decora</i> . Near Nowra, the species grows in an open forest of Spotted Gum <i>Corymbia maculata</i> , Forest Red Gum and Grey Ironbark <i>E. paniculata</i> . In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark <i>E. crebra</i> , Forest Red Gum and Black Cypress Pine <i>Callitris endlicheri</i> . | 0              | PMST                | Low. The species has not been recorded within the locality and the subject land is outside the known population distribution within the Sydney Basin Bioregion.<br><br>This species is considered extinct in western Sydney. |
| <i>Pterostylis saxicola</i> | Sydney Plains Greenhood | E                          | E                            | Known now only from Freemans Reach to Picton district. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.                                                                                                                                                                                                                                                                                                        | 0              | BAC; PMST           | Low. Associated vegetation communities not recorded within subject land, species has not been previously recorded within locality.                                                                                           |
| <i>Pultenaea parviflora</i> | Pultenaea parviflora    | E                          | V                            | Restricted to the Cumberland Plain where it grows in dry sclerophyll forest on Wianamatta shale, laterite or alluvium. Locally abundant within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. Also occurs in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.                                                                                                                                                                                                                                                                                                          | 1              | BioNet; PMST        | Low. Preferred habitat, transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland, not recorded within the subject land.                                                                           |

| SCIENTIFIC NAME              | COMMON NAME           | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                                  |
|------------------------------|-----------------------|----------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Pultenaea pedunculata</i> | Pultenaea pedunculata | E                          | Not listed                   | Restricted to Wianamatta Shales of the Cumberland Plain from Bankstown to Liverpool and on the South Coast in the Southeast Corner Bioregion at Bournda. If grows on a variety of soils in dry sclerophyll forest and disturbed sites. It is largely confined to loamy soils in dry gullies in populations in the Windellama area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0              | BAC                 | Low. Suitable habitat in the form of PCT 849 recorded within the subject land. The species has not been recorded within the locality and the subject land is outside the known population distribution within the Sydney Basin Bioregion. |
| <i>Ranunculus anemoneus</i>  | Anemone Buttercup     | V                          | V                            | The Anemone Buttercup occurs in a narrow band, only about 8km wide and 32km long, along the Great Dividing Range within Kosciuszko National Park (comprising the Main Range between Mt Kosciuszko and Mt Twynam; the Charlottes Pass resort; the Mt Perisher - Mt Blue Cow area; the Guthega - Mt Tate area; the Schlink Pass - Gungarten Pass area, the Rams Head Range and Upper parts of Thredbo, and Mt Jagungal). The Anemone Buttercup generally occurs in environments with late melting snow; on south to east facing, steep grassy slopes, or rocky crevices, or short alpine herbfields. The species has also been collected along watercourses, in grassland, heathland (below snowpatches) and on roadside batters. Soils at Anemone Buttercup sites include loams (alpine humus soils), peats and decomposing granite. | 0              | PlantNet            | Low. Subject land is generally unsuitable for species.                                                                                                                                                                                    |



| SCIENTIFIC NAME              | COMMON NAME         | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                              |
|------------------------------|---------------------|----------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <i>Syzygium paniculatum</i>  | Magenta Lilly Pilly | E                          | V                            | Occurs between Bulahdelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10             | BioNet; PMST        | Low. Preferred geologies not recorded within the subject land.                                                                        |
| <i>Tetratheca glandulosa</i> | Glandular Pink-bell | V                          | V                            | Occurs from Mangrove Mountain to the Blue Mountains where it grows in sandy or rocky heath or scrub. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop Woodland (Map Unit 10ar). Common woodland tree species include: <i>Corymbia gummifera</i> , <i>C. eximia</i> , <i>Eucalyptus haemastoma</i> , <i>E. punctata</i> , <i>E. racemosa</i> , and/or <i>E. sparsifolia</i> , with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. | 10             | BioNet              | Low. Preferred habitat, sandstone geologies and ridgetop woodland, not recorded within subject land. Associated species not recorded. |

| SCIENTIFIC NAME                                         | COMMON NAME                                                                                                                            | BC ACT STATUS <sup>1</sup> | EPBC ACT STATUS <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                              | BIONET RECORDS | SOURCE <sup>4</sup> | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                               |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Thesium australe</i>                                 | Austral Toadflax                                                                                                                       | V                          | V                            | Grows in grassland or woodland often in damp sites. It is a semi-parasitic herb and hosts are likely to be <i>Themeda triandra</i> and <i>Poa spp.</i>                                                                                                                                                                                                                                                                                                            | 0              | BAC; PMST           | Low. Host species <i>Themeda triandra</i> recorded within the subject land. The species has not been recorded within the locality and the subject land is outside the known population distribution within the Sydney Basin Bioregion. |
| <i>Wahlenbergia multicaulis</i> - endangered population | Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield | E2                         | Not listed                   | Occurs in coastal and tableland districts south from Sydney and the Blue Mountains west along the Murray River to Mathoura where it grows in a variety of habitats including forest, woodland, grassland, forest, scrub and the edges of watercourses and wetlands. It is a coloniser and typically occurs in damp, disturbed sites. Population in the Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield local government areas. | 0              | BAC                 | Moderate. Associated habitat recorded within the subject land. Endangered population known to occur within the Hills Shire LGA. Candidate species subject to targeted surveys.                                                         |
| <i>Zannichellia palustris</i>                           | Zannichellia palustris                                                                                                                 | E                          | Not listed                   | In NSW, known from the lower Hunter and in Sydney Olympic Park. Grows in fresh or slightly saline stationary or slowly flowing water.                                                                                                                                                                                                                                                                                                                             | 0              | BAC                 | Low. Subject land is generally unsuitable for species.                                                                                                                                                                                 |

(1) V = Vulnerable, E = Endangered, E2 = Endangered population, CE = Critically Endangered as listed under the *Biodiversity Conservation Act 2106* (BC Act)

(2) V = Vulnerable, E = Endangered, CE = Critically Endangered, X = Extinct as listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

(3) Habitat descriptions sourced from OEHS (NSW Office of Environment and Heritage) BioNet database and Scientific Determinations for each species.

(4) BAC = Biodiversity Assessment Calculator, BioNet = OEHS threatened biodiversity database, PlantNet = Royal Botanic Gardens spatial search, PMST = Protected Matters Search Tool

# APPENDIX B

## LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA





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# **B1 LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA**

| COMMON NAME                | SCIENTIFIC NAME                 | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                          | CREDIT TYPE | SOURCE            | LIKELIHOOD OF OCCURRENCE                                                                                                                           | OUTCOME                |
|----------------------------|---------------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------|-------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>Amphibians (6)</b>      |                                 |                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                                                                                  |             |                   |                                                                                                                                                    |                        |
| Giant Burrowing Frog       | <i>Heleioporus australiacus</i> | V                   | V                     | Exists as two distinct populations: a northern population on the sandstone geology of the Sydney Basin, from Wollemi National Park in the north, south to Jervis Bay. In the northern population there is a marked preference for sandstone ridgetop habitat and broader upland valleys where the frog is associated with small headwater and slow flowing to intermittent creeklines. The vegetation is typically woodland, open woodland and heath and may be associated with 'hanging swamp' seepage lines and where small pools form from collected water. | 0              | n/a                                                                              | n/a         | PMST              | Low. Preferred habitat, sandstone ridgetop habitat, not recorded within the subject land.                                                          | Not considered further |
| Green and Golden Bell Frog | <i>Litoria aurea</i>            | E                   | V                     | This species occurs in fragment patches near coastal locations from Vic to south of the NSW-QLD border. For breeding it utilises a wide range of waterbodies, including both natural and man-made structures, such as marshes,                                                                                                                                                                                                                                                                                                                                 | 1              | Semi/a permanent/ephemeral wet areas / Within 1km of wet areas   Swamps / Within | Species     | BAC; BioNet; PMST | Low. Marginal suitable habitat recorded within the subject land. No recent records within locality of the subject land. One record (1968) is known | Not considered further |

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| COMMON NAME         | SCIENTIFIC NAME           | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION              | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                      | OUTCOME                |
|---------------------|---------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------|-------------|--------|-------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                     |                           |                     |                       | dams and stream sides, and ephemeral wetlands. It is found in small pockets of habitat in otherwise developed areas and can occur in disturbed sites. There is a clear preference for sites with a complexity of vegetation structure and terrestrial habitat attributes which include extensive grassy areas and an abundance of shelter sites such as rocks, logs, tussock forming vegetation and other cover used for foraging and shelter. Over winter, shelter sites may be adjacent to or some distance away from breeding sites but the full range of possible habitat used is not yet well understood. |                | 1km of swamp   Waterbodies / Within 1km of waterbody |             |        | from downstream of subject land near Toongabbie.                                                                              |                        |
| Growling Grass Frog | <i>Litoria raniformis</i> | E                   | V                     | The Southern Bell Frog is usually found amongst emergent vegetation such as Typha, Phragmites and Eleocharis within or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds, and farm dams (Robinson, 1998). It also occurs in irrigation channels and crops, lignum shrublands, black box and river red gum woodlands and at the periphery of rivers. Apart from breeding and foraging habitat, refuge                                                                                                                                                                    | 0              | n/a                                                  | n/a         | PMST   | Low. Marginal suitable habitat recorded within the subject land. Not previously recorded within locality of the subject land. | Not considered further |



| COMMON NAME            | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                  | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                   | OUTCOME                |
|------------------------|-------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|------------------------------------------------------------------------------------------------------------|------------------------|
|                        |                               |                     |                       | areas for this species may include soil cracks, fallen timber, debris and dense vegetation on low, frequently inundated floodplains. Vegetation types in which this species occurs include open grassland (including crops and pastures), open forest, and ephemeral and permanent non-saline marshes and swamps.                                                                                                                     |                |                                         |             |        |                                                                                                            |                        |
| Littlejohn's Tree Frog | <i>Litoria littlejohni</i>    | V                   | V                     | Distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern Victoria. It appears to be restricted to sandstone woodland and heath communities at mid to high altitude. It forages both in the tree canopy and on the ground, and it has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats. | 0              | n/a                                     | n/a         | PMST   | Low. Preferred habitat, sandstone woodland and heath communities, not recorded within the subject land.    | Not considered further |
| Red-crowned Toadlet    | <i>Pseudophryne australis</i> | V                   | Not listed            | Occurs within 160 km of Sydney where it is restricted to Hawkesbury Sandstone. It breeds in deep grass and debris adjacent to ephemeral drainage lines. When not breeding individuals are found scattered on sandstone ridges under rocks and logs.                                                                                                                                                                                   | 7              | n/a                                     | n/a         | BioNet | Low. Species is restricted to Hawkesbury Sandstone. This geology was not recorded within the Subject land. | Not considered further |

| COMMON NAME              | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                 | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                           | CREDIT TYPE | SOURCE    | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                 | OUTCOME                |
|--------------------------|-------------------------------|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------|-------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Stuttering Frog          | <i>Mixophyes balbus</i>       | E                   | V                     | Terrestrial species, found in rainforest, Antarctic beech forest or wet sclerophyll forest. The species depends on freshwater streams and riparian vegetation for breeding and habitation. No records are known from riparian habitat that has been disturbed.                                                                                                                                                                       | 0              | n/a                                                               | n/a         | PMST      | Low. Preferred habitat, rainforest, Antarctic beech forest or wet sclerophyll forests, not recorded within the subject land.                                                             | Not considered further |
| Birds (50)               |                               |                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                                                                   |             |           |                                                                                                                                                                                          |                        |
| Australasian Bittern     | <i>Botaurus poiciloptilus</i> | E                   | E                     | Occurs in shallow, vegetated freshwater or brackish swamps. Requires permanent wetlands with tall dense vegetation, particularly bulrushes and spikerushes. When breeding, pairs are found in areas with a mixture of tall and short sedges but will also feed in more open territory.                                                                                                                                               | 0              | Waterbodies / Brackish or freshwater wetlands / PCT 835; PCT 1071 | Ecosystem   | BAC; PMST | Low. Brackish or freshwater wetlands not recorded within the subject land.                                                                                                               | Not considered further |
| Australian Painted Snipe | <i>Rostratula australis</i>   | E                   | E                     | Inhabits shallow, vegetated, temporary or infrequently filled wetlands, including where there are trees such as <i>Eucalyptus camaldulensis</i> (River Red Gum), <i>E. populnea</i> (Poplar Box) or shrubs such as <i>Muehlenbeckia florulenta</i> (Lignum) or <i>Sarcocornia quinqueflora</i> (Samphire). Feeds at the water's edge and on mudflats on seeds and invertebrates, including insects, worms, molluscs and crustaceans. | 0              | PCT 1071                                                          | Ecosystem   | BAC; PMST | Low. Associated vegetation within the study area is small in extent and was recorded in moderate condition due to weed invasion. Subject land is considered unlikely to support species. | Not considered further |

| COMMON NAME              | SCIENTIFIC NAME                     | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                        | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                                                                                   | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                                                                                           | OUTCOME                |
|--------------------------|-------------------------------------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                          |                                     |                     |                       | Males incubate eggs in a shallow scrape nest.                                                                                                                                                                                                                                                                                                               |                |                                                                                                                                           |                     |             |                                                                                                                                                                                                                                                                                                    |                        |
| Barking Owl              | <i>Ninox connivens</i>              | V                   | Not listed            | Occurs in dry sclerophyll woodland. In the south west it is often associated with riparian vegetation while in the south east it generally occurs on forest edges. It nests in large hollows in live eucalypts, often near open country. It feeds on insects in the non-breeding season and on birds and mammals in the breeding season.                    | 2              | PCT 849; PCT 835                                                                                                                          | Species / Ecosystem | BAC; BioNet | Low. Marginal habitat in the form of dry sclerophyll woodlands and riparian vegetation recorded. One hollow equal or larger than 20cm in diameter was recorded within subject lands. Species unlikely to rely on habitat and due to its small size the habitat is unlikely to support this species | Not considered further |
| Black Bittern            | <i>Ixobrychus flavicollis</i>       | V                   | Not listed            | Usually found in dense vegetation in and fringing streams, swamps, tidal creeks and mudflats, particularly amongst swamp she-oaks and mangroves. Feeds on aquatic fauna along streams, in estuaries and beside billabongs and pools. Breeding occurs in summer in secluded places in densely vegetated wetlands. It nests in trees that overhang the water. | 0              | Waterbodies / Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation / PCT 835; PCT 1071 | Ecosystem           | BAC         | Low. Habitat features such as freshwater and estuarine wetlands not recorded within the subject land.                                                                                                                                                                                              | Not considered further |
| Black-chinned Honeyeater | <i>Melithreptus gularis gularis</i> | V                   | Not listed            | Occurs within areas of annual rainfall between 400-700 mm. Feed on insects, nectar and lerps. Occupies                                                                                                                                                                                                                                                      | 2              | PCT 849; PCT 835                                                                                                                          | Ecosystem           | BAC; BioNet | Low. Though elements of suitable habitat were recorded within the subject                                                                                                                                                                                                                          | Not considered further |



| COMMON NAME          | SCIENTIFIC NAME                   | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION              | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                        | OUTCOME                |
|----------------------|-----------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------|-------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| (eastern subspecies) |                                   |                     |                       | mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark ( <i>Eucalyptus sideroxylon</i> ), White Box ( <i>E. albens</i> ), Inland Grey Box ( <i>E. microcarpa</i> ), Yellow Box ( <i>E. melliodora</i> ), Blakely's Red Gum ( <i>E. blakelyi</i> ) and Forest Red Gum ( <i>E. tereticornis</i> ). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Feeding territories are large making the species locally nomadic. It tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. |                |                                                      |             |        | land, the vegetation is considered unlikely to provide suitable habitat given its size. This species prefers large vegetation patches as birds forage over a home range of at least 5 hectares. |                        |
| Black-faced Monarch  | <i>Monarcha melanopsis</i>        | Not listed          | M                     | Occurs in rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest and in more open woodland when migrating.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0              | n/a                                                  | n/a         | PMST   | Low. Species distribution is generally limited to larger patches of remnant vegetation. Flyovers cannot be discounted during migration movements.                                               | Not considered further |
| Black-necked Stork   | <i>Ephippiorhynchus asiaticus</i> | E                   | Not listed            | The species <i>Ephippiorhynchus asiaticus</i> comprises two subspecies, <i>E. a. asiaticus</i> in India and south-east Asia, and <i>E. a. australis</i> in Australia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0              | Swamps / Shallow, open freshwater or saline wetlands | Ecosystem   | BAC    | Low. Wetlands were not recorded within the subject land.                                                                                                                                        | Not considered further |

| COMMON NAME         | SCIENTIFIC NAME      | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                                                                                                               | CREDIT TYPE         | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                | OUTCOME                |
|---------------------|----------------------|---------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------|-------------------------------------------------------------------------------------------------------------------------|------------------------|
|                     |                      |                     |                       | and New Guinea. In Australia, Black-necked Storks are widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Since 1995, breeding has been recorded as far south as Buladelah. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. |                | or shallow edges of deeper wetlands within 300m of these swamps. [Waterbodies / Shallow lakes, lake margins and estuaries within 300m of these waterbodies / PCT 1071 |                     |        |                                                                                                                         |                        |
| Black-tailed Godwit | <i>Limosa limosa</i> | V                   | M                     | A coastal species found on tidal mudflats, swamps, shallow river margins and sewage farms. Also found inland on larger shallow fresh or brackish waters. A migratory species visiting Australia between September and May.                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 0              | PCT 1071                                                                                                                                                              | Species / Ecosystem | BAC    | Low. Preferred habitat, tidal mudflats, swamps, shallow river margins or sewage farms not recorded within subject land. | Not considered further |

| COMMON NAME                            | SCIENTIFIC NAME                      | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                                                                                                                                        | OUTCOME                |
|----------------------------------------|--------------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Broad-billed Sandpiper                 | <i>Limicola falcinellus</i>          | V                   | M                     | A migratory species that breeds in the northern hemisphere between June and August. Individuals feed both on exposed mudflats and while wading in water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0              | PCT 1071                                | Species / Ecosystem | BAC         | Low. Preferred habitat, exposed mudflats, were not recorded within the subject land.                                                                                                                                                                                                                                                            | Not considered further |
| Brown Treecreeper (eastern subspecies) | <i>Climacteris picumnus victorae</i> | V                   | Not listed            | The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum ( <i>Eucalyptus camaldulensis</i> ) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for | 1              | PCT 849; PCT 835                        | Ecosystem           | BAC; BioNet | Low. Marginal habitat in the form of Eucalypt grassy woodlands, were recorded within the subject land. Prefers intact woodland with important microhabitat of fallen timber. More commonly recorded dry open forest of the inland slopes and plains inland of the Great Dividing Range. Irregular occurrences or vagrants cannot be discounted. | Not considered further |



| COMMON NAME         | SCIENTIFIC NAME              | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                                 | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                                                                           | OUTCOME                |
|---------------------|------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                     |                              |                     |                       | foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.                                                                                                                                                                                                                                                                                                                                                                                                 |                |                                                                                         |             |        |                                                                                                                                                                                    |                        |
| Bush Stone-curlew   | <i>Burhinus grallarius</i>   | E                   | Not listed            | The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.                                                                                                                                  | 0              | Fallen/standing dead timber including logs                                              | Species     | BAC    | Low. Species is considered unlikely to utilise the study area given its small extent and limited connectivity to larger patches of remnant vegetation. No records within locality. | Not considered further |
| Comb-crested Jacana | <i>Irediparra gallinacea</i> | V                   | Not listed            | The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with stragglers recorded in south-eastern NSW (possibly in response to unfavourable conditions further north). Beyond Australia, the Comb-crested Jacana occurs from Borneo and the Philippines, south and east through | 0              | Freshwater wetlands with a good surface cover of floating aquatic vegetation / PCT 1071 | Ecosystem   | BAC    | Low. Important habitat features, Freshwater wetlands with a good surface cover of floating aquatic vegetation, not recorded within subject lands.                                  | Not considered further |

| COMMON NAME       | SCIENTIFIC NAME           | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                            | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                     | OUTCOME                |
|-------------------|---------------------------|---------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                   |                           |                     |                       | Sulawesi, the Moluccas and Lesser Sunda Islands, to the Aru Islands, New Guinea and New Britain. Inhabit permanent freshwater wetlands, either still or slow-flowing, with a good surface cover of floating vegetation, especially water-lilies, or fringing and aquatic vegetation.                                                                                                                                                                            |                |                                         |             |        |                                                                                                                              |                        |
| Common Greenshank | <i>Tringa nebularia</i>   | Not listed          | M                     | Occurs in a range of inland and coastal environments. Inland, it occurs in both permanent and temporary wetlands, billabongs, swamps, lakes floodplains, sewage farms, saltworks ponds, flooded irrigated crops. On the coast, it occurs in sheltered estuaries and bays with extensive mudflats, mangrove swamps, muddy shallows of harbours and lagoons, occasionally rocky tidal ledges. It generally prefers wet and flooded mud and clay rather than sand. | 0              | n/a                                     | n/a         | PMST   | Low. Preferred habitat, mudflats, mangrove swamps, muddy shallows of harbours and lagoons, not recorded within subject land. | Not considered further |
| Common Sandpiper  | <i>Actitis hypoleucos</i> | -                   | M                     | The Common Sandpiper frequents a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. It is mostly encountered along muddy margins or rocky shores and rarely on mudflats. It has been recorded in estuaries and deltas of streams, banks farther                                                                                                                                                                          | 0              | n/a                                     | n/a         | PMST   | Low. Preferred habitat, muddy margins of waterbodies or rocky shores, not recorded within subject land.                      | Not considered further |

| COMMON NAME      | SCIENTIFIC NAME              | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE    | LIKELIHOOD OF OCCURRENCE                                                                                                                                         | OUTCOME                |
|------------------|------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                  |                              |                     |                       | upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks. |                |                                         |                     |           |                                                                                                                                                                  |                        |
| Curlew Sandpiper | <i>Calidris ferruginea</i>   | E                   | CEM                   | Occurs in inter-tidal mudflats of estuaries, lagoons, mangrove channels and also around lakes, dams, floodwaters and flooded saltbush surrounding inland lakes.                                                                                                                                                                                                                                                                                                                                                                                               | 0              | PCT 1071                                | Species / Ecosystem | BAC; PMST | Low. Preferred habitat, intertidal mudflats, not recorded within subject land.                                                                                   | Not considered further |
| Diamond Firetail | <i>Stagonopleura guttata</i> | V                   | Not listed            | Distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. In NSW, the species occurs predominantly west of the Great Dividing Range, although populations                                                                                                                                                                                                                                                                                          | 0              | PCT 849; PCT 835                        | Ecosystem           | BAC; PMST | Low. Species is considered unlikely to utilise the study area given its small extent and limited connectivity to larger patches of remnant vegetation. Irregular | Not considered further |



| COMMON NAME       | SCIENTIFIC NAME                        | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                          | OUTCOME                  |
|-------------------|----------------------------------------|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                   |                                        |                     |                       | are known from drier coastal areas. Occurs in a range of eucalypt dominated communities with a grassy understorey including woodland, forest and mallee. Most populations occur on the inland slopes of the dividing range. Firetails nest in trees and bushes, and forage on the ground, largely for grass seeds and other plant material, but also for insects.                                                                                                                                                                                                                                                                                            |                |                                         |             |             | occurrences cannot be discounted.                                                                                                                 |                          |
| Dusky Woodswallow | <i>Artamus cyanopterus cyanopterus</i> | V                   | Not listed            | The Dusky Woodswallow is widespread in eastern, southern and southwestern Australia. In New South Wales it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region. Often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. At sites where Dusky Woodswallows are | 6              | PCT 849; PCT 835; PCT 1071              | Ecosystem   | BAC; BioNet | <b>Moderate.</b> Preferred habitat recorded within subject land. Species may utilise the vegetation to the east of the subject land for foraging. | Ecosystem credit species |

| COMMON NAME         | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                       | OUTCOME                |
|---------------------|-------------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                     |                               |                     |                       | recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris. Birds are also often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber. In western New South Wales this species is primarily associated with River Red Gum/Black Box/Coolibah open forest/woodland associated with larger river/creek systems and is less common and far more patchily distributed in other communities such as mallee and cypress-pine woodland. |                |                                         |             |        |                                                                                                                                                                                                                |                        |
| Eastern Bristlebird | <i>Dasyornis brachypterus</i> | E                   | E                     | The habitat of the Eastern Bristlebird is characterised by low dense vegetation. Fire is a feature of all areas where known populations occur. Given the poor flight ability of the species it is though that few individuals survive the passage of fire, survival is dependant on the availability of fire refuges and recolonisation may be relatively slow. The bird is cryptic and camouflaged                                                                                                                                                                                                                                                            | 0              | n/a                                     | n/a         | PMST   | Low. Species is considered unlikely to utilise the study area given its small extent and limited connectivity to larger patches of remnant vegetation. This species is known to have a limited flight ability. | Not considered further |

| COMMON NAME    | SCIENTIFIC NAME                  | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                     | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE    | LIKELIHOOD OF OCCURRENCE                                                                                         | OUTCOME                |
|----------------|----------------------------------|---------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-----------|------------------------------------------------------------------------------------------------------------------|------------------------|
|                |                                  |                     |                       | and rarely seen but may be detected by its distinctive, loud calls. Confined to NSW/Queensland border region, Illawarra region and NSW/Victorian border region.                                                                                                                                                                                                                                                                          |                |                                         |                     |           |                                                                                                                  |                        |
| Eastern Curlew | <i>Numenius madagascariensis</i> | Not listed          | CEM                   | Inhabits coastal estuaries, mangroves, mud flats and sand pits. It is a migratory shorebird which generally inhabits sea and lake shore mud flats, deltas and similar areas, where it forages for crabs and other crustaceans, clam worms and other annelids, molluscs, insects and other invertebrates. Its migration route ranges from its wintering grounds in Australia to its breeding grounds in northern China, Korea and Russia. | 0              | n/a                                     | n/a                 | PMST      | Low. Preferred habitat, coastal estuaries, mangroves, mud flats and sand pits, not recorded within subject land. | Not considered further |
| Eastern Osprey | <i>Pandion cristatus</i>         | V                   | M                     | Generally a coastal species, occurring in estuaries, bays, inlets, islands and surrounding waters, coral atolls, reefs, lagoons, rock cliffs and stacks. Sometimes ascends larger rivers to far inland. Builds nests high in tree, on pylon or on ground on islands. Feeds on fish.                                                                                                                                                      | 0              | PCT 835; PCT 1071                       | Species / Ecosystem | BAC; PMST | Low. Preferred habitat such as estuaries, bays, inlets and islands not recorded within the subject land.         | Not considered further |



| COMMON NAME   | SCIENTIFIC NAME            | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                 | OUTCOME                |
|---------------|----------------------------|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|-------------|----------------------------------------------------------------------------------------------------------|------------------------|
| Flame Robin   | <i>Petroica phoenicea</i>  | V                   | Not listed            | The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. | 1              | PCT 849; PCT 835                        | Ecosystem   | BAC; BioNet | Low. Preferred habitat, moist eucalypt forest on ridges or slopes, not recorded within the subject land. | Not considered further |
| Freckled Duck | <i>Stictonetta naevosa</i> | V                   | Not listed            | In most years this species appear to be nomadic between ephemeral inland wetlands. In dry years they congregate on permanent wetlands while in wet years they breed prolifically and disperse widely, generally towards the coast. In inland eastern Australia, they generally occur in brackish to hyposaline wetlands that are densely vegetated with Lignum ( <i>Muehlenbeckia cunninghamii</i> ) within which they build their nests.                                                                                                                    | 0              | PCT 1071                                | Ecosystem   | BAC         | Low. Preferred wetlands habitat not recorded within subject land.                                        | Not considered further |

| COMMON NAME           | SCIENTIFIC NAME                 | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                                                                                    | OUTCOME                  |
|-----------------------|---------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Gang-gang Cockatoo    | <i>Callocephalon fimbriatum</i> | V                   | Not listed            | Occurs in wetter forests and woodland from sea level to an altitude over 2000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens.                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1              | PCT 849; PCT 835                        | Species / Ecosystem | BAC; BioNet | Low. Marginal foraging habitat recorded within the subject land. Prefers heavily well-timbered habitat in mature wet sclerophyll forests. May occur irregularly in whilst foraging in greater locality but is unlikely to regularly utilise or rely on the habitat within the subject land. | Not considered further   |
| Glossy Black-Cockatoo | <i>Calyptorhynchus lathami</i>  | V                   | Not listed            | The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak ( <i>Allocasuarina littoralis</i> ) and Forest Sheoak ( <i>A. torulosa</i> ) are important foods. Feeds almost exclusively on the | 3              | n/a                                     | Species / Ecosystem | BioNet      | <b>Moderate.</b> Suitable foraging species (Casuarina) recorded within the subject land.                                                                                                                                                                                                    | Ecosystem credit species |

| COMMON NAME                       | SCIENTIFIC NAME                        | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                   | OUTCOME                |
|-----------------------------------|----------------------------------------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|--------------------------------------------------------------------------------------------|------------------------|
|                                   |                                        |                     |                       | seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites.                                                                                                                                                                                                                                                                                                                                                                                       |                |                                         |             |        |                                                                                            |                        |
| Hooded Robin (south-eastern form) | <i>Melanodryas cucullata cucullata</i> | V                   | Not listed            | The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. | 0              | PCT 849; PCT 835                        | Ecosystem   | BAC    | Low. Generally unsuitable habitat recorded within the subject land.                        | Not considered further |
| Latham's Snipe                    | <i>Gallinago hardwickii</i>            | Not listed          | M                     | Occurs in freshwater or brackish wetlands generally near protective vegetation cover. This species feeds on small invertebrates, seeds and vegetation. It migrates to the northern hemisphere to breed.                                                                                                                                                                                                                                                                                                                                                                 | 0              | n/a                                     | n/a         | PMST   | Low. Preferred habitat, freshwater or brackish wetlands, not recorded within subject land. | Not considered further |



| COMMON NAME     | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                | OUTCOME                  |
|-----------------|-------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Little Eagle    | <i>Hieraaetus morphnoides</i> | V                   | Not listed            | The Little Eagle is distributed throughout the Australian mainland occupying habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Prey includes birds, reptiles and mammals, with the occasional large insect and carrion. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion. Most of its former native mammalian prey species in inland NSW are extinct and rabbits now form a major part of the diet. | 0              | PCT 849; PCT 835; PCT 1071              | Species / Ecosystem | BAC         | Low. Marginal foraging habitat within subject land. Locality is generally industrial or residential with limited remnant vegetation. May occur irregularly whilst foraging in locality. | Not considered further   |
| Little Lorikeet | <i>Glossopsitta pusilla</i>   | V                   | Not listed            | The Little Lorikeet is a small green lorikeet with black bill and red patch on forehead and throat. The underside is yellow-green. Immatures are duller with less red on face and brown bill. Found in forests, woodland, treed areas along watercourses and roads. Forages mainly on flowers, nectar and fruit. Found along coastal east Australia                                                                                                                                                                                                                                                                                                                                               | 6              | PCT 849; PCT 835                        | Ecosystem           | BAC; BioNet | <b>Moderate.</b> Species may utilise the subject land seasonally when Eucalyptus are in blossom.                                                                                        | Ecosystem credit species |

| COMMON NAME        | SCIENTIFIC NAME             | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                  | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                             | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                                                                                                 | OUTCOME                |
|--------------------|-----------------------------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------|---------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                    |                             |                     |                       | from Cape York in Queensland down east coast and round to South Australia. Uncommon in southern Victoria.                                                                                                                                                                                                                                                                                             |                |                                                                     |                     |             |                                                                                                                                                                                                                                                                                                          |                        |
| Masked Owl         | <i>Tyto novaehollandiae</i> | V                   | Not listed            | Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. | 1              | PCT 849; PCT 835                                                    | Species / Ecosystem | BAC; BioNet | Low. Marginal habitat in subject lands. Some hollows greater than 20cm diameter were recorded within the subject land. Species may irregularly occur whilst foraging in greater locality. Species unlikely to rely on habitat and due to its small size the habitat is unlikely to support this species. | Not considered further |
| Oriental Cuckoo    | <i>Cuculus opatus</i>       | Not listed          | M                     | A non-breeding migrant to Australia, it often inhabits rainforest, vine thickets, wet sclerophyll forest and open woodland and sometimes occurs in mangroves, wooded swamps and as vagrants in gardens.                                                                                                                                                                                               | 0              | n/a                                                                 | n/a                 | PMST        | Low. Subject land provides generally unsuitable habitat for species.                                                                                                                                                                                                                                     | Not considered further |
| Painted Honeyeater | <i>Grantiella picta</i>     | V                   | V                     | Lives in dry forests and woodlands. Primary food is the mistletoes in the genus <i>Amyema</i> , though it will take some nectar and insects. Its breeding distribution is dictated by presence of                                                                                                                                                                                                     | 0              | Mistletoes present at a density of greater than five mistletoes per | Ecosystem           | BAC: PMST   | Low. Preferred habitat not within subject site. In addition, preferred feed species of Mistletoes were                                                                                                                                                                                                   | Not considered further |

| COMMON NAME        | SCIENTIFIC NAME           | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                             | OUTCOME                  |
|--------------------|---------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                    |                           |                     |                       | mistletoes which are largely restricted to older trees. Less likely to be found in in strips of remnant box-ironbark woodlands, such as occur along roadsides and in windbreaks, than in wider blocks.                                                                                                                                                                                                                                                                                                                                                                                             |                | hectare / PCT 849; PCT 835              |                     |             | not recorded within the subject land.                                                                                                |                          |
| Pectoral Sandpiper | <i>Calidris melanotos</i> | Not listed          | M                     | In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species frequents coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It is usually found in coastal or near coastal habitat but occasionally further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. It has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. | 0              | n/a                                     | n/a                 | PMST        | Low. Wetlands were not recorded within the subject land.                                                                             | Not considered further   |
| Powerful Owl       | <i>Ninox strenua</i>      | V                   | Not listed            | A sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, Casuarina or Callitris pine forest and woodland. It often roosts in denser vegetation including rainforest of exotic pine                                                                                                                                                                                                                                                                                                                                                                     | 37             | PCT 849; PCT 835                        | Species / Ecosystem | BAC; BioNet | <b>Moderate.</b> Species may utilise the subject lands for foraging. Recorded in locality. No nest trees identified in subject land. | Ecosystem credit species |



| COMMON NAME       | SCIENTIFIC NAME            | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE            | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                                                           | OUTCOME                |
|-------------------|----------------------------|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                   |                            |                     |                       | plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require a shrub layer and owls are more often found in areas with more old trees and hollows than average stands.                                                                                                                                                                                                                                                     |                |                                         |                     |                   |                                                                                                                                                                                                                                                    |                        |
| Regent Honeyeater | <i>Anthochaera phrygia</i> | CE                  | CE                    | Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with <i>Casuarina cunninghamiana</i> and <i>Amyema cambagei</i> are important for feeding and breeding. Spotted Gum and Swamp Mahogany forests are also important feeding areas in coastal areas. Important food trees include <i>Eucalyptus sideroxylon</i> (Mugga Ironbark), <i>E. albens</i> (White Box), <i>E. melliodora</i> (Yellow Box) and <i>E. leucoxylon</i> (Yellow Gum). | 2              | PCT 849; PCT 835                        | Species / Ecosystem | BAC; BioNet; PMST | Low. Subject land provides generally unsuitable habitat. Important food trees not recorded. Prefers more intact forests where larger patches of blossom resources occur. Rare occurrences under suitable seasonal conditions cannot be discounted. | Not considered further |
| Rufous Fantail    | <i>Rhipidura rufifrons</i> | Not listed          | M                     | Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves,                                                                                                                                                                                                                                                                                                                                                                          | 0              | n/a                                     | n/a                 | PMST              | Low. Subject land provides generally unsuitable habitat for species. Irregular occurrences during                                                                                                                                                  | Not considered further |

| COMMON NAME      | SCIENTIFIC NAME           | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                                   | OUTCOME                |
|------------------|---------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                  |                           |                     |                       | watercourses, parks and gardens. When migrating they may also be recorded on farms, streets and buildings. Migrates to SE Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                                         |             |        | seasonal movements cannot be discounted.                                                                                                   |                        |
| Satin Flycatcher | <i>Myiagra cyanoleuca</i> | Not listed          | M                     | Widespread in eastern Australia. In Queensland, it is widespread but scattered in the east. In NSW, they are widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. In Victoria, the species is widespread in the south and east, in the area south of a line joining Numurkah, Maldon, the northern Grampians, Balmoral and Nelson. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests, often occurring | 0              | n/a                                     | n/a         | PMST   | Low. Subject land provides generally unsuitable habitat for species. Irregular occurrences during seasonal movements cannot be discounted. | Not considered further |

| COMMON NAME   | SCIENTIFIC NAME         | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                    | OUTCOME                |
|---------------|-------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|-------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------|
|               |                         |                     |                       | in gullies. They also occur in eucalypt woodlands with open understorey and grass ground cover, and are generally absent from rainforest. In south-eastern Australia, they occur at elevations of up to 1400 m above sea level, and in the ACT, they occur mainly between 800 m above sea level and the treeline.                                                                                                                                                                                                                                                                                                                                                          |                |                                         |             |             |                                                                                                                             |                        |
| Scarlet Robin | <i>Petroica boodang</i> | V                   | Not listed            | The Scarlet Robin is found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. | 1              | PCT 849; PCT 835                        | Ecosystem   | BAC; BioNet | Low. Marginal habitat recorded within the subject land. Vagrant occurrences during seasonal movements cannot be discounted. | Not considered further |



| COMMON NAME            | SCIENTIFIC NAME              | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                                                         | OUTCOME                |
|------------------------|------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Sharp-tailed Sandpiper | <i>Calidris acuminata</i>    | Not listed          | M                     | Occurs in a variety of habitats: tidal mudflat, mangrove swamps, saltmarshes, shallow fresh, brackish, salt inland swamps and lakes; flooded and irrigated paddocks, sewage farms and commercial saltfields.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0              | n/a                                     | n/a         | PMST   | Low. Preferred habitat, tidal mudflat, mangrove swamps, saltmarshes, shallow fresh, brackish, salt inland swamps and lake, not recorded within the subject land. | Not considered further |
| Speckled Warbler       | <i>Chthonicola sagittata</i> | V                   | Not listed            | The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. | 0              | PCT 849; PCT 835                        | Ecosystem   | BAC    | Low. Marginal habitat present in subject land. Prefers larger remnant patches of woodland with an understorey of shrubs, tussocks and fallen timber.             | Not considered further |

| COMMON NAME        | SCIENTIFIC NAME             | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                | OUTCOME                |
|--------------------|-----------------------------|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Spectacled Monarch | <i>Monarcha trivirgatus</i> | -                   | M                     | Occurs in the understorey of mountain/lowland rainforests, thickly wooded gullies and waterside vegetation. Migrates to NE NSW in summer to breed.                                                                                                                                                                                                                                                                                                                                                                                                                       | 0              | n/a                                     | n/a                 | PMST        | Low. Preferred habitat, rainforest and/or heavily wooded gullies not recorded within the subject land.                                                  | Not considered further |
| Spotted Harrier    | <i>Circus assimilis</i>     | V                   | Not listed            | Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Preys on terrestrial mammals (e.g. bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion. | 0              | PCT 849; PCT 1071                       | Ecosystem           | BAC         | Low. Subject land provides generally unsuitable habitat for species.                                                                                    |                        |
| Square-tailed Kite | <i>Lophoictinia isura</i>   | V                   | Not listed            | The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the                                                                                                                                                                                                                                                                                                            | 2              | PCT 849; PCT 835; PCT 1071              | Species / Ecosystem | BAC; BioNet | Low. Species is unlikely to utilise subject lands due to its higher urbanised nature providing few foraging opportunities and limited breeding habitat. | Not considered further |

| COMMON NAME   | SCIENTIFIC NAME             | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                  | OUTCOME                |
|---------------|-----------------------------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|---------------------------------------------------------------------------|------------------------|
|               |                             |                     |                       | north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.                                                                                                                                                                                                                                                                                                                                                                        |                |                                         |             |        |                                                                           |                        |
| Superb Parrot | <i>Polytelis swainsonii</i> | V                   | V                     | Found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or | 1              | n/a                                     | n/a         | BioNet | Low. Subject land is outside of species known and predicted distribution. | Not considered further |



| COMMON NAME  | SCIENTIFIC NAME          | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE            | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                             | OUTCOME                  |
|--------------|--------------------------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|              |                          |                     |                       | Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Tree species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.                                                                                                                                                                                                                                                            |                |                                         |                     |                   |                                                                                                                                                                                                      |                          |
| Swift Parrot | <i>Lathamus discolor</i> | E                   | CE                    | Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Daringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia it is semi-nomadic, foraging | 4              | PCT 849; PCT 835                        | Species / Ecosystem | BAC; BioNet; PMST | <b>Moderate.</b> Species may utilise the subject land for foraging during seasonal blossom occurrences. Breeding occurs in Tasmania. This species is considered as an ecosystem credit species only. | Ecosystem credit species |

| COMMON NAME      | SCIENTIFIC NAME                  | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                   | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                                     | OUTCOME                  |
|------------------|----------------------------------|---------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                  |                                  |                     |                       | in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering <i>Acacia pycnantha</i> , is indicated. Sites used vary from year to year.                                                                           |                |                                         |             |             |                                                                                                                                                                              |                          |
| Turquoise Parrot | <i>Neophema pulchella</i>        | V                   | Not listed            | The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. | 2              | PCT 849; PCT 835                        | Ecosystem   | BAC; BioNet | Low. Species is unlikely to utilise the study area due to its small extent and limited resources. Species is known to occur in the NNE where vegetation is larger in extent. | Not considered further   |
| Varied Sittella  | <i>Daphoenositta chrysoptera</i> | V                   | Not listed            | The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's                                                                                                                                                                                                                               | 11             | PCT 849; PCT 835                        | Ecosystem   | BAC; BioNet | <b>Moderate.</b> Species may utilise the subject land for foraging purposes.                                                                                                 | Ecosystem credit species |

| COMMON NAME             | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                             | OUTCOME                |
|-------------------------|-------------------------------|---------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------|----------------------------------------------------------------------|------------------------|
|                         |                               |                     |                       | population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.                                                                                                                                                                                                   |                |                                         |                     |             |                                                                      |                        |
| White-bellied Sea-Eagle | <i>Haliaeetus leucogaster</i> | V                   | M                     | Occurs in coastal areas including islands, estuaries, inlets, large rivers, inland lakes and reservoirs. Builds a huge nest of sticks in tall trees near water, on the ground on islands or on remote coastal cliffs.                                                                                                                                                                                                                                                                               | 2              | PCT 849; PCT 835; PCT 1071              | Species / Ecosystem | BAC; BioNet | Low. Preferred coastal habitat not recorded within the subject land. | Not considered further |
| White-fronted Chat      | <i>Epthianura albifrons</i>   | E2                  | Not listed            | The White-Fronted Chat is often found in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. | 0              | PCT 1071                                | Ecosystem           | BAC         | Low. Subject land provides generally unsuitable habitat for species. | Not considered further |



| COMMON NAME               | SCIENTIFIC NAME              | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                                       | OUTCOME                |
|---------------------------|------------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| White-throated Needletail | <i>Hirundapus caudacutus</i> | Not listed          | M                     | Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds in the northern hemisphere and migrates to Australia in October-April.                                                                                                                                                                                                                                                                                                                                    | 0              | n/a                                     | n/a         | PMST   | Low. Although species may use aerial spaces above subject land. it is unlikely to occur within terrestrial vegetation within the subject land. | Not considered further |
| Yellow Wagtail            | <i>Motacilla flava</i>       | Not listed          | M                     | This species occurs in a range of habitats including estuarine habitats such as sand dunes, mangrove forests and coastal saltmarshes. This species also occurs in open grassy areas including disturbed sites such as sports grounds and has been recorded on the edges of wetlands, swamps, lakes and farm dams. This species migrates from Asia to Australia in spring-summer. It has been recorded in the estuarine areas of the Hunter River in Newcastle NSW and in QLD and the north of NT and WA. | 0              | n/a                                     | n/a         | PMST   | Low. Preferred habitat, sand dunes, mangrove forests and coastal saltmarshes, not recorded within subject land.                                | Not considered further |
| <b>Fish (2)</b>           |                              |                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                                         |             |        |                                                                                                                                                |                        |
| Australian Grayling       | <i>Prototroctes maraena</i>  | -                   | V                     | Occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range, from Sydney, southwards to the Otway Ranges of Victoria and in Tasmania. The species is found in fresh and brackish waters of                                                                                                                                                                                                                                                                               | 0              | n/a                                     | n/a         | PMST   | Low. Subject land provides generally unsuitable habitat for species.                                                                           | Not considered further |

| COMMON NAME     | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                             | OUTCOME                |
|-----------------|-------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|----------------------------------------------------------------------|------------------------|
|                 |                               |                     |                       | coastal lagoons, from Shoalhaven River in NSW to Ewan Ponds in South Australia. The Australian Grayling is diadromous, spending part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal seas. Adults (including pre-spawning and spawning adults) inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones such as the Tambo River, which is also known to have granite outcrops. The species has also been associated with clear, gravel-bottomed habitats in the Mitchell and Wonnangatta Rivers (Victoria) and in a muddy-bottomed, heavily silted habitat in the Tarwin River (Victoria). The species has been found over 100 km upstream from the sea. |                |                                         |             |        |                                                                      |                        |
| Macquarie Perch | <i>Macquaria australasica</i> | Not listed          | E                     | Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury/Nepean and Shoalhaven catchments. Macquarie                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0              | n/a                                     | n/a         | PMST   | Low. Subject land provides generally unsuitable habitat for species. | Not considered further |

| COMMON NAME                 | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                         | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                  | CREDIT TYPE | SOURCE            | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                     | OUTCOME                |
|-----------------------------|-------------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------|-------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                             |                               |                     |                       | Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water).                                    |                |                                                                          |             |                   |                                                                                                                                                                                                              |                        |
| Invertebrates (2)           |                               |                     |                       |                                                                                                                                                                                                                                                                                                                                                                                              |                |                                                                          |             |                   |                                                                                                                                                                                                              |                        |
| Cumberland Plain Land Snail | <i>Meridolum corneovirens</i> | E                   | Not listed            | Restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. It is typically found under logs and other debris, amongst leaf litter and bark around bases of trees. It is also sometimes found under grass clumps and where possible it will burrow into loose soil. | 36             | n/a                                                                      | Species     | BAC; BioNet       | Low. Preferred habitat recorded within the subject site. Known to occur within locality. Was considered as moderate. Target surveys undertaken, however no individuals were identified within subject lands. | Not considered further |
| Dural Woodland Snail        | <i>Pommerhelix duralensis</i> | E                   | E                     | This species prefers the interface of shale-derived and sandstone- derived soils with forested habitats that contain a good native cover and woody debris. It favours shelter under rocks, inside                                                                                                                                                                                            | 13             | Leaf litter and shed bark or within 50m of litter or bark. Rocky areas / | Species     | BAC; BioNet; PMST | Low. Preferred habitat, transition soils, not recorded within the subject lands. Target surveys undertaken, however no                                                                                       | Not considered further |



| COMMON NAME               | SCIENTIFIC NAME                            | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                      | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                                                                          | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                        | OUTCOME                  |
|---------------------------|--------------------------------------------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                           |                                            |                     |                       | curled-up bark or resting in exposed areas and does not burrow or climb.                                                                                                                                                                                                                                                                  |                | Rocks or within 50m of rocks. Fallen/standing dead timber including logs / Including logs and bark or within 50m of logs or bark |                     |             | individuals were identified within subject lands.                                                                                                               |                          |
| Mammals (18)              |                                            |                     |                       |                                                                                                                                                                                                                                                                                                                                           |                |                                                                                                                                  |                     |             |                                                                                                                                                                 |                          |
| Brush-tailed Rock-wallaby | <i>Petrogale penicillate</i>               | E                   | V                     | Occurs in inland and sub-coastal south eastern Australia where it inhabits rock slopes. It has a preference for rocks which receive sunlight for a considerable part of the day. Windblown caves, rock cracks or tumbled boulders are used for shelter. Occur in small groups or "colonies" each usually separated by hundreds of metres. | 0              | n/a                                                                                                                              | n/a                 | PMST        | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation.         | Not considered further   |
| Eastern Bentwing-bat      | <i>Miniopterus schreibersii oceanensis</i> | V                   | Not listed            | Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity                                                                        | 69             | PCT 849; PCT 835; PCT 1071                                                                                                       | Species / Ecosystem | BAC; BioNet | <b>Moderate.</b> Breeding habitat not identified within subject land. Species may utilise the vegetation for foraging habitat. This species is considered as an | Ecosystem credit species |

| COMMON NAME               | SCIENTIFIC NAME                   | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                 | OUTCOME                  |
|---------------------------|-----------------------------------|---------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|-------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                           |                                   |                     |                       | cave that is used annually in spring and summer for the birth and rearing of young. Hunt in rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, Melaleuca forests and open grasslands.                                                       |                |                                         |             |             | Ecosystem credit species only.                                                                                           |                          |
| Eastern False Pipistrelle | <i>Falsistrellus tasmaniensis</i> | V                   | Not listed            | Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high.                  | 17             | n/a                                     | Ecosystem   | BioNet      | <b>Moderate.</b> Suitable habitat recorded within the subject land.                                                      | Ecosystem credit species |
| Eastern Freetail-bat      | <i>Mormopterus norfolkensis</i>   | V                   | Not listed            | The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. | 41             | PCT 849; PCT 835; PCT 1071              | Ecosystem   | BAC; BioNet | <b>Moderate.</b> Suitable habitat recorded within the subject land.                                                      | Ecosystem credit species |
| Eastern Pygmy-possum      | <i>Cercartetus nanus</i>          | V                   | Not listed            | The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW, it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga                                          | 0              | n/a                                     | Species     | BAC         | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger | Not considered further   |

| COMMON NAME             | SCIENTIFIC NAME             | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                            | OUTCOME                  |
|-------------------------|-----------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|---------------------------------------------------------------------|--------------------------|
|                         |                             |                     |                       | Wagga on the western slopes. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys or thickets of vegetation. |                |                                         |             |        | patches of remnant vegetation.                                      |                          |
| Greater Broad-nosed Bat | <i>Scoteanax rueppellii</i> | V                   | Not listed            | The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree                                                                                                                                                                                                                                                                            | 25             | n/a                                     | Ecosystem   | BioNet | <b>Moderate.</b> Suitable habitat recorded within the subject land. | Ecosystem credit species |



| COMMON NAME            | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE         | SOURCE            | LIKELIHOOD OF OCCURRENCE                                                                                                                                      | OUTCOME                  |
|------------------------|-------------------------------|---------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|---------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                        |                               |                     |                       | hollows but has also been found in the roof spaces of old buildings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                                         |                     |                   |                                                                                                                                                               |                          |
| Greater Glider         | <i>Petauroides Volans</i>     | Not listed          | V                     | The Greater Glider has a restricted distribution in eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevated range from sea level to 1200m above sea level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0              | n/a                                     | n/a                 | PMST              | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation.       | Not considered further   |
| Grey-headed Flying-fox | <i>Pteropus poliocephalus</i> | V                   | V                     | Occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly. At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, elsewhere, during spring, | 65             | PCT 849; PCT 835                        | Species / Ecosystem | BAC; BioNet: PMST | <b>Moderate.</b> No camps were recorded within the subject land. Species may utilise the vegetation for foraging habitat as part of their broader home range. | Ecosystem credit species |

| COMMON NAME | SCIENTIFIC NAME | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
|-------------|-----------------|---------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|--------------------------|---------|
|             |                 |                     |                       | <p>Grey-headed Flying-foxes are uncommon south of Nowra and widespread in other areas of their range. The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. In winter, the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW (associated with flowering Spotted Gum <i>Corymbia maculata</i>) and on the northwest slopes (generally associated with flowering White Box <i>Eucalyptus albens</i> or Mugga Ironbark <i>E. sideroxylon</i>). Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.</p> |                |                                         |             |        |                          |         |

| COMMON NAME          | SCIENTIFIC NAME               | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                         | CREDIT TYPE         | SOURCE            | LIKELIHOOD OF OCCURRENCE                                                                                                                                                                                     | OUTCOME                |
|----------------------|-------------------------------|---------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------|---------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Koala                | <i>Phascolarctos cinereus</i> | V                   | V                     | The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabits eucalypt woodlands and forests. Koalas Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. The preferred tree species vary widely on a regional and local basis. Some preferred species include Forest Red Gum <i>Eucalyptus tereticornis</i> , Grey Gum <i>E. punctata</i> . In coastal areas, Tallowwood <i>E. microcorys</i> and Swamp Mahogany <i>E. robusta</i> are important food species, while in inland areas White Box <i>E. albens</i> , Bimble Box <i>E. populnea</i> and River Red Gum <i>E. camaldulensis</i> are favoured. | 1              | PCT 849; PCT 835                                                | Species / Ecosystem | BAC; BioNet; PMST | Low. Though preferred feed tree species <i>Eucalyptus tereticornis</i> was recorded, the subject land has limited connectivity to larger patches of remnant vegetation and is unlikely to support the Koala. | Not considered further |
| Large-eared Pied Bat | <i>Chalinolobus dwyeri</i>    | V                   | V                     | Occurs in moderately wooded habitats, mainly in areas with extensive cliffs and caves and roosts in caves, mine tunnels and the abandoned, bottle-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1              | Cliffs / Within two kilometres of rocky areas containing caves, | Species             | BAC; BioNet; PMST | Low. Subject land provides generally unsuitable habitat for species. No breeding                                                                                                                             | Not considered further |



| COMMON NAME         | SCIENTIFIC NAME                  | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                                         | CREDIT TYPE         | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                 | OUTCOME                  |
|---------------------|----------------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------|---------------------|-------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                     |                                  |                     |                       | shaped mud nests of Fairy Martins (Churchill, 2008, Office of Environment and Heritage, 2011). Breeding habitat (maternity roosts) is in roof domes in sandstone caves.                                                                                                                                                                                                                                                                                                                                                                |                | overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels |                     |             | habitat within subject lands.                                                                                            |                          |
| Little Bentwing-bat | <i>Miniopterus australis</i>     | V                   | Not listed            | Distributed along the east coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. | 14             | PCT 849; PCT 835; PCT 1071                                                                      | Species / Ecosystem | BAC; BioNet | <b>Moderate.</b> Species may utilise the subject land for foraging purposes.                                             | Ecosystem credit species |
| New Holland Mouse   | <i>Pseudomys novaehollandiae</i> | Not listed          | V                     | The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, woodlands and forests with a heathland understorey                                                                                                                                                                                                                                                                                                                                    | 0              | n/a                                                                                             | n/a                 | PMST        | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger | Not considered further   |

| COMMON NAME              | SCIENTIFIC NAME         | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION                                                                                             | CREDIT TYPE | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                                                                                              | OUTCOME                |
|--------------------------|-------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                          |                         |                     |                       | and vegetated sand dunes. Due to the largely granivorous diet of the species, sites where the New Holland Mouse is found are often high in floristic diversity, especially leguminous perennials.                                                                                                                                                                                                                                                                                                                                                        |                |                                                                                                                                     |             |             | patches of remnant vegetation.                                                                                                                                                        |                        |
| Southern Brown Bandicoot | <i>Isoodon obesulus</i> | E                   | E                     | Occurs in a variety of habitats in south-eastern Australia, including heathland, shrubland, dry sclerophyll forest with heathy understorey, sedgeland and woodland. Many of the habitats are prone to fire.                                                                                                                                                                                                                                                                                                                                              | 0              | n/a                                                                                                                                 | n/a         | PMST        | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation.                               | Not considered further |
| Southern Myotis          | <i>Myotis macropus</i>  | V                   | Not listed            | Found in most habitat types in association with streams and permanent waterways usually at low elevations in flat or undulating landscapes from northern areas of Western Australia, and the Northern Territory, down the entire east coast and the southern coast of Australia to just west of the Victoria/South Australia border and inland along the Murray River. Roosts in caves, tree hollows, in clumps of dense vegetation (e.g. Pandanus), mines, tunnels, under bridges, road culverts and stormwater drains often in abandoned, intact Fairy | 19             | Hollow bearing trees / Within 200 m of riparian zone. Other / Bridges, caves or artificial structures within 200 m of riparian zone | Species     | BAC; BioNet | <b>High.</b> Species may utilise the subject lands for breeding and foraging. Small hollows recorded within 200m of riparian zone. Multiple records in the locality. Assumed present. | Species credit species |

| COMMON NAME          | SCIENTIFIC NAME           | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE            | LIKELIHOOD OF OCCURRENCE                                                                                                                                | OUTCOME                |
|----------------------|---------------------------|---------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                      |                           |                     |                       | Martin nests. Roost sites are strongly associated with bodies of water where this species commonly feeds on aquatic insects, shrimp and small fish at the water surface, however, aerial foraging for other insects is also known. Breeding habitat likely to coincide with roosting habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                                         |             |                   |                                                                                                                                                         |                        |
| Spotted-tailed Quoll | <i>Dasyurus maculatus</i> | V                   | E                     | Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold (NSW National Parks and Wildlife Service, 1999g). Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, | 1              | PCT 849; PCT 835; PCT 1071              | Ecosystem   | BAC; BioNet; PMST | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation. | Not considered further |



| COMMON NAME           | SCIENTIFIC NAME              | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE                                                                                                                                | OUTCOME                |
|-----------------------|------------------------------|---------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                       |                              |                     |                       | terrestrial and arboreal mammals, small macropods, reptiles and arthropods.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                                         |             |        |                                                                                                                                                         |                        |
| Squirrel Glider       | <i>Petaurus norfolcensis</i> | V                   | Not listed            | The Squirrel Glider is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland. In NSW it is found in dry sclerophyll forest and woodland but not found in dense coastal ranges, inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. It is associated with mixed tree species stands with a shrub or Acacia midstorey. It requires abundant tree hollows for refuge and nest sites and feeds on gum of acacias, eucalypt sap and invertebrates. | 0              | n/a                                     | Species     | BAC    | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation. | Not considered further |
| Yellow-bellied Glider | <i>Petaurus australis</i>    | V                   | Not listed            | Restricted to tall, mature eucalypt forest in high rainfall areas of temperate to sub-tropical eastern Australia. Feeds on nectar, pollen, the sap of eucalypts and sometimes insects. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and                                                                                                                                                                                                                                                                                                                                                     | 1              | n/a                                     | n/a         | BioNet | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation. | Not considered further |

| COMMON NAME                   | SCIENTIFIC NAME                  | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE      | LIKELIHOOD OF OCCURRENCE                                                                                      | OUTCOME                  |
|-------------------------------|----------------------------------|---------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------|-------------|-------------|---------------------------------------------------------------------------------------------------------------|--------------------------|
|                               |                                  |                     |                       | nesting hollows and year round food resources are available from a mixture of eucalypt species.                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                                         |             |             |                                                                                                               |                          |
| Yellow-bellied Sheathtail-bat | <i>Saccolaimus flaviventris</i>  | V                   | Not listed            | This species is widespread through tropical Australia and migrates to southern Australia in summer. Occurs in eucalypt forest where it feeds above the canopy and in mallee or open country where it feeds closer to the ground. Generally a solitary species but sometimes found in colonies of up to 10. It roosts and breeds in tree hollows but has also been recorded roosting under exfoliating bark, in burrows of terrestrial mammals, in soil cracks and under slabs of rock and in the nests of bird and sugar gliders. | 11             | PCT 849; PCT 835                        | Ecosystem   | BAC; BioNet | <b>Moderate.</b> Species may utilise the subject site for foraging and breeding.                              | Ecosystem credit species |
| Reptiles (1)                  |                                  |                     |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                                         |             |             |                                                                                                               |                          |
| Broad-headed Snake            | <i>Hoplocephalus bungaroides</i> | E                   | V                     | A nocturnal species that occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during                                                                                                                                                                                                                | 0              | n/a                                     | n/a         | PMST        | Low. Preferred habitat, sandstone outcrops and heathy sandstone vegetation, not recorded within subject land. | Not considered further   |

| COMMON NAME | SCIENTIFIC NAME | BC ACT <sup>1</sup> | EPBC ACT <sup>2</sup> | HABITAT <sup>3</sup>                              | BIONET RECORDS | HABITAT FEATURE / ASSOCIATED VEGETATION | CREDIT TYPE | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
|-------------|-----------------|---------------------|-----------------------|---------------------------------------------------|----------------|-----------------------------------------|-------------|--------|--------------------------|---------|
|             |                 |                     |                       | the cooler months and tree hollows during summer. |                |                                         |             |        |                          |         |

1. V = Vulnerable, E = Endangered, E2 = Endangered population, CE = Critically Endangered as listed under the *Biodiversity Conservation Act 2016* (BC Act)
2. V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory as listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
3. Habitat descriptions sourced from OEH (NSW Office of Environment and Heritage) BioNet database and Scientific Determinations for each species.
4. Habitat features as identified by the BAC (Biodiversity Assessment Calculator)
5. BAC = Biodiversity Assessment Calculator, BioNet = OEH threatened biodiversity database, PMST = Protected Matters Search Tool



# APPENDIX C

## BAM VEGETATION INTEGRITY PLOT DATA



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# C1 BAM VEGETATION INTEGRITY PLOT DATA

|                                                                                                                             |       |           |           |        |       |        |       |       |       |       |        |            |     |                         |                |
|-----------------------------------------------------------------------------------------------------------------------------|-------|-----------|-----------|--------|-------|--------|-------|-------|-------|-------|--------|------------|-----|-------------------------|----------------|
| Q1                                                                                                                          |       |           | Covers    | Native | Trees | Shrubs | Grass | Forb  | Fern  | Other | Exotic | HighThreat |     | Easting                 | 309384         |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition) |       |           | # spp     | Count  | Count | Count  | Count | Count | Count | Count | Count  | Count      |     | Northing                | 6265932        |
| Date 16/01/19                                                                                                               |       |           | 38        | 12     | 1     | 2      | 4     | 3     | 0     | 2     | 26     | 4          |     | Orientation             | 140            |
| Species                                                                                                                     | Cover | Abundance | Sum cover | Sum    | Sum   | Sum    | Sum   | Sum   | Sum   | Sum   | Sum    | Sum        |     | Plot size               | 20x20 in 20x50 |
|                                                                                                                             |       |           | 119.6     | 37.8   | 30    | 4      | 2.9   | 0.4   | 0     | 0.5   | 81.8   | 12.8       |     | Attributes 20x50m plot  |                |
| Avena fatua*                                                                                                                | 0.6   | 40        | EX        |        |       |        |       |       |       |       | 0.6    |            |     | Stem classes            |                |
| Bidens pilosa*                                                                                                              | 3     | 100       | EX        |        |       |        |       |       |       |       | 3      |            |     | 80+                     | 1              |
| Briza subaristata*                                                                                                          | 3     | 100       | EX        |        |       |        |       |       |       |       | 3      |            |     | 50-79                   | 2              |
| Cenchrus clandestinus*                                                                                                      | 45    | 500       | EX        |        |       |        |       |       |       |       | 45     |            |     | 30-49                   | No             |
| Centaurium erythraea*                                                                                                       | 0.4   | 20        | EX        |        |       |        |       |       |       |       | 0.4    |            |     | 20-29                   | Yes            |
| Chloris gayana*                                                                                                             | 1     | 30        | HT        |        |       |        |       |       |       |       |        |            | 1   | 10-19                   | Yes            |
| Clivia miniata*                                                                                                             | 0.1   | 2         | EX        |        |       |        |       |       |       |       | 0.1    |            |     | 5-9                     | Yes            |
| Conyza bonariensis*                                                                                                         | 0.6   | 40        | EX        |        |       |        |       |       |       |       | 0.6    |            |     | <5                      | Yes            |
| Cynodon dactylon                                                                                                            | 2     | 100       | GG        |        |       |        | 2     |       |       |       |        |            |     | Hollows                 | 0              |
| Dichondra repens                                                                                                            | 0.1   | 5         | FG        |        |       |        |       | 0.1   |       |       |        |            |     | Length logs (m)         | 0              |
| Einadia hastata                                                                                                             | 0.2   | 10        | FG        |        |       |        |       | 0.2   |       |       |        |            |     |                         |                |
| Eragrostis curvula*                                                                                                         | 0.8   | 10        | HT        |        |       |        |       |       |       |       |        |            | 0.8 | Attributes 1x1 plot (%) |                |
| Eucalyptus tereticornis                                                                                                     | 30    | 50        | TG        |        | 30    |        |       |       |       |       |        |            |     | Litter (%)              | 9              |
| Glycine tabacina                                                                                                            | 0.4   | 20        | OG        |        |       |        |       |       |       | 0.4   |        |            |     | Bare ground (%)         | 20             |
| Hardenbergia violacea                                                                                                       | 0.1   | 2         | OG        |        |       |        |       |       |       | 0.1   |        |            |     | Vegetation (%)          | 71             |
| Juncus usitatus                                                                                                             | 0.2   | 5         | GG        |        |       |        | 0.2   |       |       |       |        |            |     | Rock (%)                | 0              |
| Lomandra longifolia                                                                                                         | 0.1   | 1         | GG        |        |       |        | 0.1   |       |       |       |        |            |     |                         | 100            |
| Lotus angustissimus*                                                                                                        | 0.5   | 50        | EX        |        |       |        |       |       |       |       | 0.5    |            |     |                         |                |
| Melaleuca linariifolia                                                                                                      | 2     | 3         | SG        |        |       | 2      |       |       |       |       |        |            |     |                         |                |
| Melinis repens*                                                                                                             | 0.5   | 50        | EX        |        |       |        |       |       |       |       | 0.5    |            |     |                         |                |
| Microlaena stipoides var. stipoides                                                                                         | 0.6   | 5         | GG        |        |       |        | 0.6   |       |       |       |        |            |     |                         |                |
| Modiola caroliniana*                                                                                                        | 0.1   | 5         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Oxalis purpurea*                                                                                                            | 0.1   | 5         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Panicum maximum*                                                                                                            | 0.1   | 5         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Paspalum dilatatum*                                                                                                         | 10    | 200       | HT        |        |       |        |       |       |       |       |        |            | 10  |                         |                |
| Pistacia chinensis*                                                                                                         | 1     | 10        | HT        |        |       |        |       |       |       |       |        |            | 1   |                         |                |
| Plantago lanceolata*                                                                                                        | 2     | 100       | EX        |        |       |        |       |       |       |       | 2      |            |     |                         |                |
| Platysace lanceolata                                                                                                        | 2     | 100       | SG        |        |       | 2      |       |       |       |       |        |            |     |                         |                |
| Pyrostegia venusta*                                                                                                         | 0.7   | 2         | EX        |        |       |        |       |       |       |       | 0.7    |            |     |                         |                |
| Setaria parviflora*                                                                                                         | 5     | 200       | EX        |        |       |        |       |       |       |       | 5      |            |     |                         |                |
| Sida rhombifolia*                                                                                                           | 5     | 100       | EX        |        |       |        |       |       |       |       | 5      |            |     |                         |                |
| Solanum nigrum*                                                                                                             | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Solanum pseudocapsicum*                                                                                                     | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Solanum sisymbriifolium*                                                                                                    | 0.6   | 10        | EX        |        |       |        |       |       |       |       | 0.6    |            |     |                         |                |
| Taraxacum officinale*                                                                                                       | 0.4   | 10        | EX        |        |       |        |       |       |       |       | 0.4    |            |     |                         |                |
| Verbena bonariensis*                                                                                                        | 1     | 50        | EX        |        |       |        |       |       |       |       | 1      |            |     |                         |                |
| Yucca aloifolia*                                                                                                            | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Zornia dyctiocarpa var. dyctiocarpa                                                                                         | 0.1   | 5         | FG        |        |       |        |       | 0.1   |       |       |        |            |     |                         |                |



|                                                                                                                                 |       |           |           |        |       |        |       |       |       |       |        |            |     |                         |               |
|---------------------------------------------------------------------------------------------------------------------------------|-------|-----------|-----------|--------|-------|--------|-------|-------|-------|-------|--------|------------|-----|-------------------------|---------------|
| Q3                                                                                                                              |       |           | Covers    | Native | Trees | Shrubs | Grass | Forb  | Fern  | Other | Exotic | HighThreat |     | Easting                 | 309200        |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition) |       |           | # spp     | Count  | Count | Count  | Count | Count | Count | Count | Count  | Count      |     | Northing                | 6266582       |
| Date 16/01/19                                                                                                                   |       |           | 45        | 29     | 1     | 1      | 12    | 12    | 0     | 3     | 16     | 4          |     | Orientation             | 125           |
| Species                                                                                                                         | Cover | Abundance | Sum cover | Sum    | Sum   | Sum    | Sum   | Sum   | Sum   | Sum   | Sum    | Sum        |     | Plot size               | 20x20in 20x50 |
|                                                                                                                                 |       |           | 110.6     | 89.2   | 35    | 0.3    | 41.7  | 9     | 0     | 3.2   | 21.4   | 10.6       |     | Attributes 20x50m plot  |               |
| Anagallis arvensis*                                                                                                             | 0.3   | 20        | EX        |        |       |        |       |       |       |       | 0.3    |            |     | Stem classes            |               |
| Anthosachne scabra                                                                                                              | 0.2   | 10        | GG        |        |       |        | 0.2   |       |       |       |        |            |     | 80+                     | 0             |
| Aristida ramosa                                                                                                                 | 3     | 80        | GG        |        |       |        | 3     |       |       |       |        |            |     | 50-79                   | 4             |
| Aristida vagans                                                                                                                 | 15    | 200       | GG        |        |       |        | 15    |       |       |       |        |            |     | 30-49                   | Yes           |
| Arthropodium milleflorum                                                                                                        | 0.4   | 30        | FG        |        |       |        |       | 0.4   |       |       |        |            |     | 20-29                   | Yes           |
| Briza subaristata*                                                                                                              | 0.4   | 20        | EX        |        |       |        |       |       |       |       | 0.4    |            |     | 10-19                   | Yes           |
| Brunoniella australis                                                                                                           | 1     | 60        | FG        |        |       |        |       | 1     |       |       |        |            |     | 5-9                     | Yes           |
| Carex inversa                                                                                                                   | 10    | 300       | GG        |        |       |        | 10    |       |       |       |        |            |     | <5                      | Yes           |
| Crassula sieberiana                                                                                                             | 0.4   | 30        | FG        |        |       |        |       | 0.4   |       |       |        |            |     | Hollows                 | 3             |
| Cynodon dactylon                                                                                                                | 0.4   | 20        | GG        |        |       |        | 0.4   |       |       |       |        |            |     | Length logs (m)         | 33            |
| Cyperus gracilis                                                                                                                | 5     | 300       | GG        |        |       |        | 5     |       |       |       |        |            |     |                         |               |
| Desmodium gunnii                                                                                                                | 0.8   | 60        | FG        |        |       |        |       | 0.8   |       |       |        |            |     | Attributes 1x1 plot (%) |               |
| Dichondra repens                                                                                                                | 2     | 100       | FG        |        |       |        |       | 2     |       |       |        |            |     | Litter (%)              | 22            |
| Ehrharta erecta*                                                                                                                | 0.1   | 5         | HT        |        |       |        |       |       |       |       |        |            | 0.1 | Bare ground (%)         | 34            |
| Einadia hastata                                                                                                                 | 0.1   | 5         | FG        |        |       |        |       | 0.1   |       |       |        |            |     | Vegetation (%)          | 44            |
| Einadia nutans subsp. nutans                                                                                                    | 0.4   | 10        | FG        |        |       |        |       | 0.4   |       |       |        |            |     | Rock (%)                | 0             |
| Eragrostis curvula*                                                                                                             | 0.3   | 5         | HT        |        |       |        |       |       |       |       |        |            | 0.3 |                         | 100           |
| Eucalyptus crebra                                                                                                               | 35    | 50        | TG        |        | 35    |        |       |       |       |       |        |            |     |                         |               |
| Euphorbia peplus*                                                                                                               | 0.6   | 50        | EX        |        |       |        |       |       |       |       | 0.6    |            |     |                         |               |
| Fimbristylis dichotoma                                                                                                          | 0.7   | 30        | GG        |        |       |        | 0.7   |       |       |       |        |            |     |                         |               |
| Glycine clandestina                                                                                                             | 0.1   | 5         | OG        |        |       |        |       |       |       | 0.1   |        |            |     |                         |               |
| Glycine microphylla                                                                                                             | 0.1   |           | OG        |        |       |        |       |       |       | 0.1   |        |            |     |                         |               |
| Glycine tabacina                                                                                                                | 3     | 100       | OG        |        |       |        |       |       |       | 3     |        |            |     |                         |               |
| Hypochoeris radicata*                                                                                                           | 0.1   | 2         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |               |
| Lagenifera stipitata                                                                                                            | 0.1   | 1         | FG        |        |       |        |       | 0.1   |       |       |        |            |     |                         |               |
| Leontodon taraxacoides*                                                                                                         | 0.4   | 10        | EX        |        |       |        |       |       |       |       | 0.4    |            |     |                         |               |
| Lomandra filiformis subsp. filiformis                                                                                           | 0.5   | 30        | GG        |        |       |        | 0.5   |       |       |       |        |            |     |                         |               |
| Lomandra multiflora                                                                                                             | 0.5   | 10        | GG        |        |       |        | 0.5   |       |       |       |        |            |     |                         |               |
| Oxalis perennans                                                                                                                | 1     | 80        | FG        |        |       |        |       | 1     |       |       |        |            |     |                         |               |
| Paspalidium aversum                                                                                                             | 0.4   | 10        | GG        |        |       |        | 0.4   |       |       |       |        |            |     |                         |               |
| Paspalum dilatatum*                                                                                                             | 10    | 200       | HT        |        |       |        |       |       |       |       |        |            | 10  |                         |               |
| Phyllanthus virgatus                                                                                                            | 2     | 100       | FG        |        |       |        |       | 2     |       |       |        |            |     |                         |               |
| Platysace lanceolata                                                                                                            | 0.3   | 10        | SG        |        |       | 0.3    |       |       |       |       |        |            |     |                         |               |
| Rytidosperma caespitosum                                                                                                        | 5     | 100       | GG        |        |       |        | 5     |       |       |       |        |            |     |                         |               |
| Senecio madagascarensis*                                                                                                        | 0.2   | 6         | HT        |        |       |        |       |       |       |       |        |            | 0.2 |                         |               |
| Setaria parviflora*                                                                                                             | 5     | 100       | EX        |        |       |        |       |       |       |       | 5      |            |     |                         |               |
| Sida rhombifolia*                                                                                                               | 2     | 60        | EX        |        |       |        |       |       |       |       | 2      |            |     |                         |               |

Q3 (cont.)

|                          |     |    |    |  |  |  |   |     |  |  |     |  |  |  |  |
|--------------------------|-----|----|----|--|--|--|---|-----|--|--|-----|--|--|--|--|
| Sisymbrium officinale*   | 0.4 | 10 | EX |  |  |  |   |     |  |  | 0.4 |  |  |  |  |
| Solanum pseudocapsicum*  | 0.6 | 3  | EX |  |  |  |   |     |  |  | 0.6 |  |  |  |  |
| Solanum sisymbriifolium* | 0.1 | 3  | EX |  |  |  |   |     |  |  | 0.1 |  |  |  |  |
| Sonchus oleraceus*       | 0.1 | 1  | EX |  |  |  |   |     |  |  | 0.1 |  |  |  |  |
| Sporobolus creber        | 1   | 60 | GG |  |  |  | 1 |     |  |  |     |  |  |  |  |
| Tricoryne elatior        | 0.6 | 40 | FG |  |  |  |   | 0.6 |  |  |     |  |  |  |  |
| Verbena bonariensis*     | 0.8 | 20 | EX |  |  |  |   |     |  |  | 0.8 |  |  |  |  |
| Wahlenbergia gracilis    | 0.2 | 10 | FG |  |  |  |   | 0.2 |  |  |     |  |  |  |  |

|                                                                                                                                 |       |           |           |        |       |        |       |       |       |       |        |            |     |                         |                |
|---------------------------------------------------------------------------------------------------------------------------------|-------|-----------|-----------|--------|-------|--------|-------|-------|-------|-------|--------|------------|-----|-------------------------|----------------|
| Q4                                                                                                                              |       |           | Covers    | Native | Trees | Shrubs | Grass | Forb  | Fern  | Other | Exotic | HighThreat |     | Easting                 | 309305         |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition) |       |           |           | Count  | Count | Count  | Count | Count | Count | Count | Count  | Count      |     | Northing                | 6266499        |
| Date 16/01/19                                                                                                                   |       |           | # spp     | 43     | 32    | 2      | 0     | 14    | 12    | 1     | 3      | 11         | 2   | Orientation             | 40             |
| Species                                                                                                                         | Cover | Abundance | Sum cover | Sum    | Sum   | Sum    | Sum   | Sum   | Sum   | Sum   | Sum    | Sum        | Sum | Plot size               | 20x20 in 20x50 |
|                                                                                                                                 |       |           | 96.3      | 80.2   | 35.4  | 0      | 25.4  | 16.4  | 0.5   | 2.5   | 16.1   | 1.8        |     | Attributes 20x50m plot  |                |
| Acacia parramattensis                                                                                                           | 0.4   | 4         | TG        |        | 0.4   |        |       |       |       |       |        |            |     | Stem classes            |                |
| Aristida ramosa                                                                                                                 | 0.8   | 40        | GG        |        |       |        | 0.8   |       |       |       |        |            |     | 80+                     | 1              |
| Aristida vagans                                                                                                                 | 10    | 300       | GG        |        |       |        | 10    |       |       |       |        |            |     | 50-79                   | 3              |
| Briza subaristata*                                                                                                              | 0.1   | 5         | EX        |        |       |        |       |       |       |       | 0.1    |            |     | 30-49                   | Yes            |
| Centaurium erythraea*                                                                                                           | 0.1   | 5         | EX        |        |       |        |       |       |       |       | 0.1    |            |     | 20-29                   | Yes            |
| Cheilanthes sieberi subsp. sieberi                                                                                              | 0.5   | 40        | EG        |        |       |        |       |       | 0.5   |       |        |            |     | 10-19                   | Yes            |
| Chloris ventricosa                                                                                                              | 0.5   | 30        | GG        |        |       |        | 0.5   |       |       |       |        |            |     | 5-9                     | Yes            |
| Cirsium vulgare*                                                                                                                | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |     | <5                      | Yes            |
| Commelina cyanea                                                                                                                | 4     | 100       | FG        |        |       |        |       | 4     |       |       |        |            |     | Hollows                 | 3              |
| Cymbopogon refractus                                                                                                            | 0.8   | 20        | GG        |        |       |        | 0.8   |       |       |       |        |            |     | Length logs (m)         | 13             |
| Cyperus gracilis                                                                                                                | 1     | 80        | GG        |        |       |        | 1     |       |       |       |        |            |     |                         |                |
| Desmodium brachypodium                                                                                                          | 0.6   | 20        | FG        |        |       |        |       | 0.6   |       |       |        |            |     | Attributes 1x1 plot (%) |                |
| Desmodium gunnii                                                                                                                | 2     | 80        | FG        |        |       |        |       | 2     |       |       |        |            |     | Litter (%)              | 60             |
| Dichelachne micrantha                                                                                                           | 0.4   | 10        | GG        |        |       |        | 0.4   |       |       |       |        |            |     | Bare ground (%)         | 4              |
| Dichondra repens                                                                                                                | 2     | 100       | FG        |        |       |        |       | 2     |       |       |        |            |     | Vegetation (%)          | 36             |
| Einadia hastata                                                                                                                 | 0.5   | 10        | FG        |        |       |        |       | 0.5   |       |       |        |            |     | Rock (%)                | 0              |
| Eragrostis curvula*                                                                                                             | 1     | 20        | HT        |        |       |        |       |       |       |       |        |            | 1   |                         | 100            |
| Eucalyptus crebra                                                                                                               | 35    | 30        | TG        |        | 35    |        |       |       |       |       |        |            |     |                         |                |
| Euphorbia peplus*                                                                                                               |       |           | EX        |        |       |        |       |       |       |       | 0      |            |     |                         |                |
| Fimbristylis dichotoma                                                                                                          | 0.3   | 20        | GG        |        |       |        | 0.3   |       |       |       |        |            |     |                         |                |
| Glycine clandestina                                                                                                             | 0.3   | 20        | OG        |        |       |        |       |       |       | 0.3   |        |            |     |                         |                |
| Glycine microphylla                                                                                                             | 0.2   | 10        | OG        |        |       |        |       |       |       | 0.2   |        |            |     |                         |                |
| Glycine tabacina                                                                                                                | 2     | 100       | OG        |        |       |        |       |       |       | 2     |        |            |     |                         |                |
| Juncus usitatus                                                                                                                 | 0.1   | 2         | GG        |        |       |        | 0.1   |       |       |       |        |            |     |                         |                |
| Lomandra filiformis subsp. filiformis                                                                                           |       |           | GG        |        |       |        | 0     |       |       |       |        |            |     |                         |                |



Q4 (cont.)

|                                     |     |     |    |  |  |  |     |     |  |     |     |  |  |  |
|-------------------------------------|-----|-----|----|--|--|--|-----|-----|--|-----|-----|--|--|--|
| Microlaena stipoides var. stipoides | 5   | 200 | GG |  |  |  | 5   |     |  |     |     |  |  |  |
| Oxalis perennans                    | 5   | 500 | FG |  |  |  |     | 5   |  |     |     |  |  |  |
| Paspalidium aversum                 | 1   | 30  | GG |  |  |  | 1   |     |  |     |     |  |  |  |
| Paspalum distichum                  | 0.5 | 20  | GG |  |  |  | 0.5 |     |  |     |     |  |  |  |
| Phyllanthus virgatus                | 0.2 | 10  | FG |  |  |  |     | 0.2 |  |     |     |  |  |  |
| Poranthera microphylla              | 0.3 | 10  | FG |  |  |  |     | 0.3 |  |     |     |  |  |  |
| Rytidosperma caespitosum            | 3   | 100 | GG |  |  |  | 3   |     |  |     |     |  |  |  |
| Senecio madagascarensis*            | 0.8 | 30  | HT |  |  |  |     |     |  |     | 0.8 |  |  |  |
| Setaria parviflora*                 | 3   | 80  | EX |  |  |  |     |     |  | 3   |     |  |  |  |
| Sida rhombifolia*                   | 10  | 500 | EX |  |  |  |     |     |  | 10  |     |  |  |  |
| Solanum americanum*                 | 0.1 | 5   | FG |  |  |  |     | 0.1 |  |     |     |  |  |  |
| Solanum nigrum*                     | 0.1 | 2   | EX |  |  |  |     |     |  | 0.1 |     |  |  |  |
| Solanum prinophyllum                | 1   | 40  | FG |  |  |  |     | 1   |  |     |     |  |  |  |
| Solanum pseudocapsicum*             | 0.1 | 1   | EX |  |  |  |     |     |  | 0.1 |     |  |  |  |
| Solanum sisymbriifolium*            | 0.8 | 30  | EX |  |  |  |     |     |  | 0.8 |     |  |  |  |
| Themeda triandra                    | 2   | 50  | GG |  |  |  | 2   |     |  |     |     |  |  |  |
| Tricoryne elatior                   | 0.6 | 30  | FG |  |  |  |     | 0.6 |  |     |     |  |  |  |
| Veronica plebeia                    | 0.1 | 1   | FG |  |  |  |     | 0.1 |  |     |     |  |  |  |

|                                                                                                                                   |       |           |           |        |       |        |       |       |       |       |        |            |  |                         |                |
|-----------------------------------------------------------------------------------------------------------------------------------|-------|-----------|-----------|--------|-------|--------|-------|-------|-------|-------|--------|------------|--|-------------------------|----------------|
| Q6                                                                                                                                |       |           | Covers    | Native | Trees | Shrubs | Grass | Forb  | Fern  | Other | Exotic | HighThreat |  | Easting                 | 309329         |
| PCT 1071 Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (Moderate condition) |       |           | # spp     | Count  | Count | Count  | Count | Count | Count | Count | Count  | Count      |  | Northing                | 6266968        |
| Date 07/02/19                                                                                                                     |       |           | 23        | 5      | 2     | 0      | 2     | 1     | 0     | 0     | 18     | 6          |  | Orientation             | 290            |
| Species                                                                                                                           | Cover | Abundance | Sum cover | Sum    | Sum   | Sum    | Sum   | Sum   | Sum   | Sum   | Sum    | Sum        |  | Plot size               | 20x20 in 20x50 |
|                                                                                                                                   |       |           | 120.2     | 88.7   | 2.4   | 0      | 86    | 0.3   | 0     | 0     | 31.5   | 9.2        |  | Attributes 20x50m plot  |                |
| Alternanthera denticulata                                                                                                         | 0.3   | 1         | FG        |        |       |        |       | 0.3   |       |       |        |            |  | Stem classes            |                |
| Angophora floribunda                                                                                                              | 0.4   | 1         | TG        |        | 0.4   |        |       |       |       |       |        |            |  | 80+                     |                |
| Bidens pilosa*                                                                                                                    | 0.1   | 4         | EX        |        |       |        |       |       |       |       | 0.1    |            |  | 50-79                   |                |
| Bromus catharticus*                                                                                                               | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |  | 30-49                   |                |
| Casuarina glauca                                                                                                                  | 2     | 8         | TG        |        | 2     |        |       |       |       |       |        |            |  | 20-29                   |                |
| Cenchrus clandestinus*                                                                                                            | 4     | 100       | EX        |        |       |        |       |       |       |       | 4      |            |  | 10-19                   |                |
| Cestrum parqui*                                                                                                                   | 0.4   | 4         | HT        |        |       |        |       |       |       |       |        | 0.4        |  | 5-9                     |                |
| Cirsium vulgare*                                                                                                                  | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |  | <5                      |                |
| Cynodon dactylon                                                                                                                  | 1     | 60        | GG        |        |       |        | 1     |       |       |       |        |            |  | Hollows                 |                |
| Cyperus eragrostis*                                                                                                               | 0.3   | 10        | HT        |        |       |        |       |       |       |       |        | 0.3        |  | Length logs (m)         |                |
| Juncus acutus*                                                                                                                    | 2     | 5         | HT        |        |       |        |       |       |       |       |        | 2          |  |                         |                |
| Lactuca serriola*                                                                                                                 | 0.3   | 3         | EX        |        |       |        |       |       |       |       | 0.3    |            |  | Attributes 1x1 plot (%) |                |
| Ligustrum sinense*                                                                                                                | 1     | 1         | HT        |        |       |        |       |       |       |       |        | 1          |  | Litter (%)              |                |
| Paspalum dilatatum*                                                                                                               | 0.5   | 10        | HT        |        |       |        |       |       |       |       |        | 0.5        |  | Bare ground (%)         |                |
| Paspalum urvillei*                                                                                                                | 0.6   | 10        | EX        |        |       |        |       |       |       |       | 0.6    |            |  | Vegetation (%)          |                |
| Passiflora subpeltata*                                                                                                            | 0.9   | 2         | EX        |        |       |        |       |       |       |       | 0.9    |            |  | Rock (%)                |                |
| Rorippa palustris*                                                                                                                | 0.1   | 20        | EX        |        |       |        |       |       |       |       | 0.1    |            |  |                         |                |
| Rubus fruticosus agg.*                                                                                                            | 5     | 30        | HT        |        |       |        |       |       |       |       |        | 5          |  |                         |                |
| Rumex crispus*                                                                                                                    | 0.8   | 10        | EX        |        |       |        |       |       |       |       | 0.8    |            |  |                         |                |
| Scutellaria racemosa*                                                                                                             | 15    | 100       | EX        |        |       |        |       |       |       |       | 15     |            |  |                         |                |
| Solanum mauritianum*                                                                                                              | 0.2   | 1         | EX        |        |       |        |       |       |       |       | 0.2    |            |  |                         |                |
| Sonchus oleraceus*                                                                                                                | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |  |                         |                |
| Typha orientalis                                                                                                                  | 85    | 400       | GG        |        |       |        | 85    |       |       |       |        |            |  |                         |                |

|                                                                                                                                 |       |           |           |        |       |        |       |       |       |       |        |            |     |                         |                |
|---------------------------------------------------------------------------------------------------------------------------------|-------|-----------|-----------|--------|-------|--------|-------|-------|-------|-------|--------|------------|-----|-------------------------|----------------|
| Q7                                                                                                                              |       |           | Covers    | Native | Trees | Shrubs | Grass | Forb  | Fern  | Other | Exotic | HighThreat |     | Easting                 | 309211         |
| PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (Moderate condition) |       |           | # spp     | Count  | Count | Count  | Count | Count | Count | Count | Count  | Count      |     | Northing                | 6266727        |
| Date 07/02/19                                                                                                                   |       |           | 29        | 23     | 1     | 0      | 12    | 8     | 0     | 2     | 6      | 1          |     | Orientation             | 230            |
| Species                                                                                                                         | Cover | Abundance | Sum cover | Sum    | Sum   | Sum    | Sum   | Sum   | Sum   | Sum   | Sum    | Sum        |     | Plot size               | 20x20 in 20x50 |
|                                                                                                                                 |       |           | 104.8     | 63.1   | 24    | 0      | 18.8  | 19.5  | 0     | 0.8   | 41.7   | 0.5        |     | Attributes 20x50m plot  |                |
| Brunoniella australis                                                                                                           | 0.6   | 30        | FG        |        |       |        |       | 0.6   |       |       |        |            |     | Stem classes            |                |
| Carex inversa                                                                                                                   | 0.8   | 40        | GG        |        |       |        | 0.8   |       |       |       |        |            |     | 80+                     | 0              |
| Chloris truncata                                                                                                                | 0.8   | 30        | GG        |        |       |        | 0.8   |       |       |       |        |            |     | 50-79                   | 2              |
| Commelina cyanea                                                                                                                | 3     | 100       | FG        |        |       |        |       | 3     |       |       |        |            |     | 30-49                   | Yes            |
| Cyperus gracilis                                                                                                                | 4     | 300       | GG        |        |       |        | 4     |       |       |       |        |            |     | 20-29                   | Yes            |
| Desmodium gunnii                                                                                                                | 0.1   | 10        | FG        |        |       |        |       | 0.1   |       |       |        |            |     | 10-19                   | Yes            |
| Dichelachne micrantha                                                                                                           | 2     | 100       | GG        |        |       |        | 2     |       |       |       |        |            |     | 5-9                     | Yes            |
| Dichondra repens                                                                                                                | 0.4   | 20        | FG        |        |       |        |       | 0.4   |       |       |        |            |     | <5                      | No             |
| Digitaria parviflora                                                                                                            | 1     | 50        | GG        |        |       |        | 1     |       |       |       |        |            |     | Hollows                 | 0              |
| Echinopogon ovatus                                                                                                              | 0.4   | 20        | GG        |        |       |        | 0.4   |       |       |       |        |            |     | Length logs (m)         | 5              |
| Ehrharta erecta*                                                                                                                | 0.5   | 30        | HT        |        |       |        |       |       |       |       |        |            | 0.5 |                         |                |
| Einadia hastata                                                                                                                 | 10    | 500       | FG        |        |       |        |       | 10    |       |       |        |            |     | Attributes 1x1 plot (%) |                |
| Einadia nutans subsp. nutans                                                                                                    | 2     | 80        | FG        |        |       |        |       | 2     |       |       |        |            |     | Litter (%)              | 30             |
| Eragrostis leptostachya                                                                                                         | 1     | 50        | GG        |        |       |        | 1     |       |       |       |        |            |     | Bare ground (%)         | 2              |
| Eucalyptus crebra                                                                                                               | 24    | 20        | TG        |        | 24    |        |       |       |       |       |        |            |     | Vegetation (%)          | 68             |
| Glycine clandestina                                                                                                             | 0.1   | 3         | OG        |        |       |        |       |       |       | 0.1   |        |            |     | Rock (%)                | 0              |
| Glycine tabacina                                                                                                                | 0.7   | 50        | OG        |        |       |        |       |       |       | 0.7   |        |            |     |                         | 100            |
| Juncus usitatus                                                                                                                 | 0.4   | 10        | GG        |        |       |        | 0.4   |       |       |       |        |            |     |                         |                |
| Lomandra filiformis subsp. filiformis                                                                                           | 0.4   | 10        | GG        |        |       |        | 0.4   |       |       |       |        |            |     |                         |                |
| Microlaena stipoides var. stipoides                                                                                             | 2     | 100       | GG        |        |       |        | 2     |       |       |       |        |            |     |                         |                |
| Modiola caroliniana*                                                                                                            | 0.2   | 10        | EX        |        |       |        |       |       |       |       | 0.2    |            |     |                         |                |
| Oxalis perennans                                                                                                                | 0.4   | 10        | FG        |        |       |        |       | 0.4   |       |       |        |            |     |                         |                |
| Paspalidium distans                                                                                                             | 4     | 200       | GG        |        |       |        | 4     |       |       |       |        |            |     |                         |                |
| Rorippa palustris*                                                                                                              | 2     | 80        | EX        |        |       |        |       |       |       |       | 2      |            |     |                         |                |
| Setaria parviflora*                                                                                                             | 5     | 200       | EX        |        |       |        |       |       |       |       | 5      |            |     |                         |                |
| Sida rhombifolia*                                                                                                               | 30    | 500       | EX        |        |       |        |       |       |       |       | 30     |            |     |                         |                |
| Solanum prinophyllum                                                                                                            | 3     | 80        | FG        |        |       |        |       | 3     |       |       |        |            |     |                         |                |
| Solanum pseudocapsicum*                                                                                                         | 4     | 100       | EX        |        |       |        |       |       |       |       | 4      |            |     |                         |                |
| Sporobolus creber                                                                                                               | 2     | 100       | GG        |        |       |        | 2     |       |       |       |        |            |     |                         |                |



|                                                                                                                                                |       |           |           |        |       |        |       |       |       |       |        |            |     |                         |                |
|------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------|-----------|--------|-------|--------|-------|-------|-------|-------|--------|------------|-----|-------------------------|----------------|
| Q8                                                                                                                                             |       |           | Covers    | Native | Trees | Shrubs | Grass | Forb  | Fern  | Other | Exotic | HighThreat |     | Easting                 | 309448         |
| PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (Poor condition) |       |           | # spp     | Count  | Count | Count  | Count | Count | Count | Count | Count  | Count      |     | Northing                | 6266610        |
| Date 07/02/19                                                                                                                                  |       |           | 39        | 17     | 1     | 0      | 10    | 5     | 0     | 1     | 22     | 5          |     | Orientation             | 320            |
| Species                                                                                                                                        | Cover | Abundance | Sum cover | Sum    | Sum   | Sum    | Sum   | Sum   | Sum   | Sum   | Sum    | Sum        |     | Plot size               | 20x20 in 20x50 |
|                                                                                                                                                |       |           | 117.5     | 38.3   | 18    | 0      | 17.5  | 2.7   | 0     | 0.1   | 79.2   | 48.2       |     | Attributes 20x50m plot  |                |
| Anagallis arvensis*                                                                                                                            | 0.6   | 30        | EX        |        |       |        |       |       |       |       | 0.6    |            |     | Stem classes            |                |
| Angophora floribunda                                                                                                                           | 18    | 12        | TG        |        | 18    |        |       |       |       |       |        |            |     | 80+                     | 1              |
| Araujia sericifera*                                                                                                                            | 0.4   | 3         | HT        |        |       |        |       |       |       |       |        |            | 0.4 | 50-79                   | 1              |
| Aristida ramosa                                                                                                                                | 1     | 50        | GG        |        |       |        | 1     |       |       |       |        |            |     | 30-49                   | Yes            |
| Asparagus asparagoides*                                                                                                                        | 0.4   | 5         | HT        |        |       |        |       |       |       |       |        |            | 0.4 | 20-29                   | Yes            |
| Axonopus fissifolius*                                                                                                                          | 0.4   | 10        | HT        |        |       |        |       |       |       |       |        |            | 0.4 | 10-19                   | Yes            |
| Bothriochloa macra                                                                                                                             | 0.1   | 1         | GG        |        |       |        | 0.1   |       |       |       |        |            |     | 5-9                     | Yes            |
| Briza subaristata*                                                                                                                             | 0.2   | 5         | EX        |        |       |        |       |       |       |       | 0.2    |            |     | <5                      | Yes            |
| Cenchrus clandestinus*                                                                                                                         | 15    | 200       | EX        |        |       |        |       |       |       |       | 15     |            |     | Hollows                 | 3              |
| Centaurium erythraea*                                                                                                                          | 0.4   | 30        | EX        |        |       |        |       |       |       |       | 0.4    |            |     | Length logs (m)         | 5              |
| Centella asiatica                                                                                                                              | 2     | 100       | FG        |        |       |        |       | 2     |       |       |        |            |     |                         |                |
| Cirsium vulgare*                                                                                                                               | 3     | 50        | EX        |        |       |        |       |       |       |       | 3      |            |     | Attributes 1x1 plot (%) |                |
| Cyperus gracilis                                                                                                                               | 1     | 60        | GG        |        |       |        | 1     |       |       |       |        |            |     | Litter (%)              | 20             |
| Dichondra repens                                                                                                                               | 0.2   | 10        | FG        |        |       |        |       | 0.2   |       |       |        |            |     | Bare ground (%)         | 8              |
| Einadia hastata                                                                                                                                | 0.2   | 5         | FG        |        |       |        |       | 0.2   |       |       |        |            |     | Vegetation (%)          | 69             |
| Eragrostis curvula*                                                                                                                            | 2     | 40        | HT        |        |       |        |       |       |       |       |        |            | 2   | Rock (%)                | 3              |
| Eragrostis leptostachya                                                                                                                        | 1     | 50        | GG        |        |       |        | 1     |       |       |       |        |            |     |                         | 100            |
| Euphorbia peplus*                                                                                                                              | 0.4   | 40        | EX        |        |       |        |       |       |       |       | 0.4    |            |     |                         |                |
| Fimbristylis dichotoma                                                                                                                         | 0.2   | 10        | GG        |        |       |        | 0.2   |       |       |       |        |            |     |                         |                |
| Glycine clandestina                                                                                                                            | 0.1   | 3         | OG        |        |       |        |       |       |       | 0.1   |        |            |     |                         |                |
| Hypochaeris radicata*                                                                                                                          | 0.3   | 30        | EX        |        |       |        |       |       |       |       | 0.3    |            |     |                         |                |
| Juncus usitatus                                                                                                                                | 0.1   | 5         | GG        |        |       |        | 0.1   |       |       |       |        |            |     |                         |                |
| Lactuca serriola*                                                                                                                              | 0.8   | 20        | EX        |        |       |        |       |       |       |       | 0.8    |            |     |                         |                |
| Lomandra longifolia                                                                                                                            | 0.3   | 1         | GG        |        |       |        | 0.3   |       |       |       |        |            |     |                         |                |
| Microlaena stipoides var. stipoides                                                                                                            | 10    | 200       | GG        |        |       |        | 10    |       |       |       |        |            |     |                         |                |
| Modiola caroliniana*                                                                                                                           | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Paspalidium distans                                                                                                                            | 3     | 80        | GG        |        |       |        | 3     |       |       |       |        |            |     |                         |                |
| Paspalum dilatatum*                                                                                                                            | 45    | 1000      | HT        |        |       |        |       |       |       |       |        |            | 45  |                         |                |
| Paspalum urvillei*                                                                                                                             | 0.5   | 5         | EX        |        |       |        |       |       |       |       | 0.5    |            |     |                         |                |
| Phyllanthus virgatus                                                                                                                           | 0.2   | 5         | FG        |        |       |        |       | 0.2   |       |       |        |            |     |                         |                |
| Plantago lanceolata*                                                                                                                           | 0.8   | 40        | EX        |        |       |        |       |       |       |       | 0.8    |            |     |                         |                |
| Richardia stellaris*                                                                                                                           | 0.1   | 1         | EX        |        |       |        |       |       |       |       | 0.1    |            |     |                         |                |
| Setaria parviflora*                                                                                                                            | 5     | 200       | EX        |        |       |        |       |       |       |       | 5      |            |     |                         |                |
| Sida rhombifolia*                                                                                                                              | 1     | 50        | EX        |        |       |        |       |       |       |       | 1      |            |     |                         |                |
| Solanum americanum*                                                                                                                            | 0.1   | 1         | FG        |        |       |        |       | 0.1   |       |       |        |            |     |                         |                |
| Solanum nigrum*                                                                                                                                | 0.2   | 2         | EX        |        |       |        |       |       |       |       | 0.2    |            |     |                         |                |
| Solanum sisymbriifolium*                                                                                                                       | 0.6   | 10        | EX        |        |       |        |       |       |       |       | 0.6    |            |     |                         |                |
| Sporobolus creber                                                                                                                              | 0.8   | 40        | GG        |        |       |        | 0.8   |       |       |       |        |            |     |                         |                |
| Verbena bonariensis*                                                                                                                           | 2     | 80        | EX        |        |       |        |       |       |       |       | 2      |            |     |                         |                |

# APPENDIX D

## BAM CREDIT REPORT



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# D1 BAM CREDIT REPORT

# BAM Credit Summary Report

## Proposal Details

|                                |                                  |                         |
|--------------------------------|----------------------------------|-------------------------|
| Assessment Id                  | Proposal Name                    | BAM data last updated * |
| 00015204/BAAS18097/19/00015205 | Bella Vista Precinct Master Plan | 18/06/2020              |
| Assessor Name                  | Report Created                   | BAM Data version *      |
| Mark Stables                   | 10/07/2020                       | 29                      |
| Assessor Number                | BAM Case Status                  | Date Finalised          |
| BAAS18097                      | 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 | Vegetation integrity loss / gain | Area (ha) | Constant | Species sensitivity to gain class (for BRW) | Biodiversity risk weighting | Potential SAIL  | Ecosystem credits |
|------------------------------------|----------------------|----------------------------------|-----------|----------|---------------------------------------------|-----------------------------|-----------------|-------------------|
| <b>Cumberland riverflat forest</b> |                      |                                  |           |          |                                             |                             |                 |                   |
| 1                                  | 835_Poor             | 48.1                             | 0.1       | 0.25     | High Sensitivity to Potential Gain          | 2.00                        |                 | 1                 |
|                                    |                      |                                  |           |          |                                             |                             | <b>Subtotal</b> | <b>1</b>          |



## BAM Credit Summary Report

| Cumberland shale plains woodland |              |      |     |      |                                    |      |          |    |
|----------------------------------|--------------|------|-----|------|------------------------------------|------|----------|----|
| 2                                | 849_Moderate | 67.9 | 0.8 | 0.25 | High Sensitivity to Potential Gain | 2.50 | TRUE     | 32 |
| 3                                | 849_Poor     | 31.5 | 1.0 | 0.25 | High Sensitivity to Potential Gain | 2.50 | TRUE     | 20 |
|                                  |              |      |     |      |                                    |      | Subtotal | 52 |
|                                  |              |      |     |      |                                    |      | Total    | 53 |

### Species credits for threatened species

| Vegetation zone name                                             | Habitat condition (HC) | Area (ha) / individual (HL) | Constant | Biodiversity risk weighting | Potential SAIL  | Species credits |
|------------------------------------------------------------------|------------------------|-----------------------------|----------|-----------------------------|-----------------|-----------------|
| <b><i>Myotis macropus</i> / <i>Southern Myotis</i> ( Fauna )</b> |                        |                             |          |                             |                 |                 |
| 835_Poor                                                         | 48.1                   | 0.06                        | 0.25     | 2                           | False           | 1               |
| 849_Moderate                                                     | 67.9                   | 0.75                        | 0.25     | 2                           | False           | 25              |
| 849_Poor                                                         | 31.5                   | 0.79                        | 0.25     | 2                           | False           | 12              |
|                                                                  |                        |                             |          |                             | <b>Subtotal</b> | <b>38</b>       |

# BAM Predicted Species Report

## Proposal Details

|                                |                                  |                         |
|--------------------------------|----------------------------------|-------------------------|
| Assessment Id                  | Proposal Name                    | BAM data last updated * |
| 00015204/BAAS18097/19/00015205 | Bella Vista Precinct Master Plan | 18/06/2020              |
| Assessor Name                  | Report Created                   | BAM Data version *      |
| Mark Stables                   | 10/07/2020                       | 29                      |
| Assessor Number                | Assessment Type                  | BAM Case Status         |
| BAAS18097                      | Major Projects                   | Open                    |
|                                | Assessment Revision              | Date Finalised          |
|                                | 0                                | To be finalised         |

\* 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.

**Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.**

| Common Name                     | Scientific Name                 | Vegetation Types(s)                  |
|---------------------------------|---------------------------------|--------------------------------------|
| Dusky Woodswallow               | Artamus cyanopterus cyanopterus | 835-Cumberland riverflat forest      |
|                                 |                                 | 849-Cumberland shale plains woodland |
| Eastern Coastal Free-tailed Bat | Micronomus norfolkensis         | 835-Cumberland riverflat forest      |
|                                 |                                 | 849-Cumberland shale plains woodland |
| Grey-headed Flying-fox          | Pteropus poliocephalus          | 835-Cumberland riverflat forest      |
|                                 |                                 | 849-Cumberland shale plains woodland |
| Large Bent-winged Bat           | Miniopterus orianae oceanensis  | 835-Cumberland riverflat forest      |
|                                 |                                 | 849-Cumberland shale plains woodland |
| Little Bent-winged Bat          | Miniopterus australis           | 835-Cumberland riverflat forest      |
|                                 |                                 | 849-Cumberland shale plains woodland |
| Little Lorikeet                 | Glossopsitta pusilla            | 835-Cumberland riverflat forest      |
|                                 |                                 | 849-Cumberland shale plains woodland |
| Swift Parrot                    | Lathamus discolor               | 835-Cumberland riverflat forest      |
|                                 |                                 | 849-Cumberland shale plains woodland |

## Threatened species not within the area of these PCT's

## BAM Predicted Species Report

| Common Name                            | Scientific Name                        | Vegetation Types(s)                                                     |
|----------------------------------------|----------------------------------------|-------------------------------------------------------------------------|
| Australasian Bittern                   | <i>Botaurus poiciloptilus</i>          | 835-Cumberland riverflat forest                                         |
| Brown Treecreeper (eastern subspecies) | <i>Climacteris picumnus victoriae</i>  | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Diamond Firetail                       | <i>Stagonopleura guttata</i>           | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Eastern Osprey                         | <i>Pandion cristatus</i>               | 835-Cumberland riverflat forest                                         |
| Flame Robin                            | <i>Petroica phoenicea</i>              | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Hooded Robin (south-eastern form)      | <i>Melanodryas cucullata cucullata</i> | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Koala                                  | <i>Phascolarctos cinereus</i>          | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Regent Honeyeater                      | <i>Anthochaera phrygia</i>             | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Scarlet Robin                          | <i>Petroica boodang</i>                | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Speckled Warbler                       | <i>Chthonicola sagittata</i>           | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| Spotted-tailed Quoll                   | <i>Dasyurus maculatus</i>              | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |
| White-bellied Sea-Eagle                | <i>Haliaeetus leucogaster</i>          | 835-Cumberland riverflat forest<br>849-Cumberland shale plains woodland |

# BAM Candidate Species Report

## Proposal Details

|                                |                                  |                         |
|--------------------------------|----------------------------------|-------------------------|
| Assessment Id                  | Proposal Name                    | BAM data last updated * |
| 00015204/BAAS18097/19/00015205 | Bella Vista Precinct Master Plan | 18/06/2020              |
| Assessor Name                  | Report Created                   | BAM Data version *      |
| Mark Stables                   | 10/07/2020                       | 29                      |
| Assessor Number                | Assessment Type                  | BAM Case Status         |
| BAAS18097                      | Major Projects                   | Open                    |
|                                | Assessment Revision              | Date Finalised          |
|                                | 0                                | To be finalised         |

\* 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.

## List of Species Requiring Survey

| Name                                                                                                                                                                                                     | Presence      | Survey Months                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------------------------------------|
| <b><i>Acacia pubescens</i></b><br>Downy Wattle                                                                                                                                                           | No (surveyed) | <div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div> |
| <b><i>Grevillea juniperina subsp. juniperina</i></b><br>Juniper-leaved Grevillea                                                                                                                         | No (surveyed) | <div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div> |
| <b><i>Pommerhelix duralensis</i></b><br>Dural Land Snail                                                                                                                                                 | No (surveyed) | <div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div> |
| <b><i>Wahlenbergia multicaulis - endangered population</i></b><br>Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield | No (surveyed) | <div>Jan Feb Mar Apr May Jun</div> <div>Jul Aug Sep Oct Nov Dec</div> |



## BAM Candidate Species Report

|                                                                                        |                       |                                                    |
|----------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------|
| <b><i>Meridolum corneovirens</i></b><br>Cumberland Plain Land Snail                    | No (surveyed)         | Jan Feb Mar Apr May Jun<br>Jul Aug Sep Oct Nov Dec |
| <b><i>Myotis macropus</i></b><br>Southern Myotis                                       | Yes (assumed present) | Jan Feb Mar Apr May Jun<br>Jul Aug Sep Oct Nov Dec |
| <b><i>Pimelea curviflora var. curviflora</i></b><br>Pimelea curviflora var. curviflora | No (surveyed)         | Jan Feb Mar Apr May Jun<br>Jul Aug Sep Oct Nov Dec |
| <b><i>Pimelea spicata</i></b><br>Spiked Rice-flower                                    | No (surveyed)         | Jan Feb Mar Apr May Jun<br>Jul Aug Sep Oct Nov Dec |

### List of Species Not On Site

| Name                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Acacia bynoeana</i></b> Bynoe's Wattle                                                                                                                                                                                                                  |
| <b><i>Caladenia tessellata</i></b> Thick Lip Spider Orchid                                                                                                                                                                                                    |
| <b><i>Callistemon linearifolius</i></b> Netted Bottle Brush                                                                                                                                                                                                   |
| <b><i>Cynanchum elegans</i></b> White-flowered Wax Plant                                                                                                                                                                                                      |
| <b><i>Eucalyptus benthamii</i></b> Camden White Gum                                                                                                                                                                                                           |
| <b><i>Dillwynia tenuifolia</i></b> Dillwynia tenuifolia                                                                                                                                                                                                       |
| <b><i>Haliaeetus leucogaster</i></b> White-bellied Sea-Eagle                                                                                                                                                                                                  |
| <b><i>Dillwynia tenuifolia - endangered population</i></b> Dillwynia tenuifolia, Kemps Creek                                                                                                                                                                  |
| <b><i>Marsdenia viridiflora subsp. viridiflora - endangered population</i></b> Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas |
| <b><i>Lathamus discolor</i></b> Swift Parrot                                                                                                                                                                                                                  |
| <b><i>Litoria aurea</i></b> Green and Golden Bell Frog                                                                                                                                                                                                        |
| <b><i>Miniopterus australis</i></b> Little Bent-winged Bat                                                                                                                                                                                                    |
| <b><i>Miniopterus orianae oceanensis</i></b> Large Bent-winged Bat                                                                                                                                                                                            |
| <b><i>Pandion cristatus</i></b> Eastern Osprey                                                                                                                                                                                                                |

|                                                               |
|---------------------------------------------------------------|
| <b><i>Persicaria elatior</i></b> Tall Knotweed                |
| <b><i>Persoonia bargoensis</i></b> Bargo Geebung              |
| <b><i>Persoonia hirsuta</i></b> Hairy Geebung                 |
| <b><i>Petaurus norfolcensis</i></b> Squirrel Glider           |
| <b><i>Phascolarctos cinereus</i></b> Koala                    |
| <b><i>Pilularia novae-hollandiae</i></b> Austral Pillwort     |
| <b><i>Pomaderris brunnea</i></b> Brown Pomaderris             |
| <b><i>Pteropus poliocephalus</i></b> Grey-headed Flying-fox   |
| <b><i>Pterostylis saxicola</i></b> Sydney Plains Greenhood    |
| <b><i>Pultenaea pedunculata</i></b> Matted Bush-pea           |
| <b><i>Thesium australe</i></b> Austral Toadflax               |
| <b><i>Anthochaera phrygia</i></b> Regent Honeyeater           |
| <b><i>Hibbertia sp. Bankstown</i></b> Hibbertia sp. Bankstown |

# BAM Vegetation Zones Report

## Proposal Details

|                                                                                                                                                                                       |                                  |                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------|
| Assessment Id                                                                                                                                                                         | Assessment name                  | BAM data last updated * |
| 00015204/BAAS18097/19/00015205                                                                                                                                                        | Bella Vista Precinct Master Plan | 18/06/2020              |
| Assessor Name                                                                                                                                                                         | Report Created                   | BAM Data version *      |
| Mark Stables                                                                                                                                                                          | 10/07/2020                       | 29                      |
| Assessor Number                                                                                                                                                                       | Assessment Type                  | BAM Case Status         |
| BAAS18097                                                                                                                                                                             | Major Projects                   | Open                    |
| * 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. |                                  | Date Finalised          |
|                                                                                                                                                                                       |                                  | To be finalised         |
|                                                                                                                                                                                       | Assessment Revision              |                         |
|                                                                                                                                                                                       | 0                                |                         |

## Vegetation Zones

| # | Name         | PCT                                  | Condition | Area | Minimum number of plots | Management zones |
|---|--------------|--------------------------------------|-----------|------|-------------------------|------------------|
| 1 | 835_Poor     | 835-Cumberland riverflat forest      | Poor      | 0.06 | 1                       |                  |
| 2 | 849_Moderate | 849-Cumberland shale plains woodland | Moderate  | 0.75 | 1                       |                  |
| 3 | 849_Poor     | 849-Cumberland shale plains woodland | Poor      | 1.04 | 1                       |                  |



## BAM Biodiversity Credit Report (Like for like)

### Proposal Details

|                                |                                  |                         |
|--------------------------------|----------------------------------|-------------------------|
| Assessment Id                  | Proposal Name                    | BAM data last updated * |
| 00015204/BAAS18097/19/00015205 | Bella Vista Precinct Master Plan | 18/06/2020              |
| Assessor Name                  | Assessor Number                  | BAM Data version *      |
| Mark Stables                   | BAAS18097                        | 29                      |
| Proponent Names                | Report Created                   | BAM Case Status         |
|                                | 10/07/2020                       | Open                    |
| Assessment Revision            | Assessment Type                  | Date Finalised          |
| 0                              | Major Projects                   | To be finalised         |

\* 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.

### Potential Serious and Irreversible Impacts

| Name of threatened ecological community                 | Listing status                             | Name of Plant Community Type/ID      |
|---------------------------------------------------------|--------------------------------------------|--------------------------------------|
| Cumberland Plain Woodland in the Sydney Basin Bioregion | Critically Endangered Ecological Community | 849-Cumberland shale plains woodland |

Nil

### Additional Information for Approval

PCTs With Customized Benchmarks



## BAM Biodiversity Credit Report (Like for like)

No Changes

Predicted Threatened Species Not On Site

| Name                                                                           |
|--------------------------------------------------------------------------------|
| <b>Botaurus poeciloptilus</b> / Australasian Bittern                           |
| <b>Climacteris picumnus victoriae</b> / Brown Treecreeper (eastern subspecies) |
| <b>Dasyurus maculatus</b> / Spotted-tailed Quoll                               |
| <b>Petroica phoenicea</b> / Flame Robin                                        |
| <b>Petroica boodang</b> / Scarlet Robin                                        |
| <b>Haliaeetus leucogaster</b> / White-bellied Sea-Eagle                        |
| <b>Melanodryas cucullata cucullata</b> / Hooded Robin (south-eastern form)     |
| <b>Pandion cristatus</b> / Eastern Osprey                                      |
| <b>Phascolarctos cinereus</b> / Koala                                          |
| <b>Chthonicola sagittata</b> / Speckled Warbler                                |
| <b>Stagonopleura guttata</b> / Diamond Firetail                                |
| <b>Anthochaera phrygia</b> / Regent Honeyeater                                 |

### Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

## BAM Biodiversity Credit Report (Like for like)

| Name of Plant Community Type/ID      | Name of threatened ecological community                                                                                             | Area of impact | Number of credits to be retired |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|
| 835-Cumberland riverflat forest      | River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions | 0.1            | 1.00                            |
| 849-Cumberland shale plains woodland | Cumberland Plain Woodland in the Sydney Basin Bioregion                                                                             | 1.8            | 52.00                           |

### 835-Cumberland riverflat forest

#### Like-for-like credit retirement options

| Name of offset trading group                                                                                                                                                                                                                                                                            | Trading group | HBT | IBRA region                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions<br>This includes PCT's:<br>686, 828, 835, 839, 941, 971, 1064, 1108, 1109, 1212, 1228, 1232, 1293, 1318, 1326, 1386, 1522, 1556, 1594, 1618, 1646, 1648, 1720, 1794 | -             | Yes | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

### 849-Cumberland shale plains woodland

#### Like-for-like credit retirement options

| Name of offset trading group | Trading group | HBT | IBRA region |
|------------------------------|---------------|-----|-------------|
|------------------------------|---------------|-----|-------------|

## BAM Biodiversity Credit Report (Like for like)

|  |                                                                                             |   |     |                                                                                                                                                                           |
|--|---------------------------------------------------------------------------------------------|---|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Cumberland Plain Woodland in the Sydney Basin Bioregion<br>This includes PCT's:<br>849, 850 | - | Yes | Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo.<br>or<br>Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |
|--|---------------------------------------------------------------------------------------------|---|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Species Credit Summary

| Species                                     |              | Area                                           | Credits     |
|---------------------------------------------|--------------|------------------------------------------------|-------------|
| <b>Myotis macropus</b> / Southern Myotis    |              | 1.6                                            | 38.00       |
| <b>Myotis macropus</b> /<br>Southern Myotis | 835_Poor     | <b>Like-for-like credit retirement options</b> |             |
|                                             |              | Spp                                            | IBRA region |
|                                             |              | <b>Myotis macropus</b> /Southern Myotis        | Any in NSW  |
|                                             |              |                                                |             |
|                                             |              |                                                |             |
|                                             | 849_Moderate | <b>Like-for-like credit retirement options</b> |             |
|                                             |              | Spp                                            | IBRA region |
|                                             |              | <b>Myotis macropus</b> /Southern Myotis        | Any in NSW  |
|                                             |              |                                                |             |
|                                             |              |                                                |             |

## BAM Biodiversity Credit Report (Like for like)

|                                     |              |                                         |             |
|-------------------------------------|--------------|-----------------------------------------|-------------|
| Myotis macropus/<br>Southern Myotis | 849_Moderate |                                         |             |
|                                     | 849_Poor     | Like-for-like credit retirement options |             |
|                                     |              | Spp                                     | IBRA region |
|                                     |              | Myotis macropus/Southern Myotis         | Any in NSW  |
|                                     |              |                                         |             |



# APPENDIX E

## EPBC ACT SIGNIFICANCE ASSESSMENT



## CUMBERLAND PLAIN SHALE WOODLAND

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is protected under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013).

**An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:**

- **Reduce the extent of an ecological community.**

The proposed action will result in the loss of 0.37 ha of EPBC Act listed Cumberland Plain Woodland.

- **Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.**

Currently, this community within and adjacent to the subject land is fragmented by the existing urban infrastructure (residential structures), roads and parkland. The proposed action will slightly increase existing fragmentation.

Cumberland Plain Woodland within the subject land occurs in relatively small patches which are subject to existing edge effects. As such, the removal of 0.37 ha of EPBC Act listed Cumberland Plain Woodland associated within the proposed action is unlikely to significantly exacerbate the fragmentation and/or isolation of vegetation or have a significant impact on ecological processes such as pollination and seed dispersal and is unlikely to affect the viability of the local occurrence of the community.

- **Adversely affect habitat critical to the survival of an ecological community**

There is no critical habitat listed under the EPBC Act for Cumberland Plain Woodland. In section 12 of the Cumberland Plain Recovery Plan, Priority Conservation Lands are considered to contain habitat critical to the survival of threatened entities, including Cumberland Plain Woodland (Department of Environment Climate Change and Water, 2010). No part of the subject land has been identified as Priority Conservation Land. The habitat within the subject land is not considered to be critical to the survival of the community.

- **Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.**

The proposed action will adversely modify the soil profile in the areas that require clearing of vegetation within the subject land. The proposed action may also modify abiotic factors such as groundwater levels of surface water drainage patterns necessary to the survival of remaining Cumberland Plain Shale Woodland surrounding the subject land. The proposed mitigation measures are likely to minimise and mitigate these indirect impacts.

- **Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.**

Cumberland Plain Woodland to be impacted is currently directly adjacent to urban development and construction land and experiences associated edge effects. Whilst the proposed action may introduce edge effects to the remaining Cumberland Plain Woodland within proximity to the proposed action it is unlikely these impacts will be significant. If the proposed mitigation measures are implemented, weed control will be monitored and managed and the proposed action is unlikely to cause a substantial change in the species composition of an occurrence of an ecological community. The proposed action does not involve actions that would significantly change the existing disturbance regime such as the intensity or frequency of fires, the intensity or frequency floods. As such the proposed action is unlikely to cause a substantial change in the species composition of an occurrence of an ecological community.

**Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:**

- **assisting invasive species, that are harmful to the listed ecological community, to become established**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

The proposed action has potential to result in minor increases in the establishment, density or diversity of weed species. Cumberland Plain Woodland within the subject land was recorded in a range of condition classes; moderate, canopy only and regeneration native understorey. Each condition class experienced some level of weed invasion due to the existing edge effects associated with surrounding development and construction activities. As such, the proposed action is unlikely to exacerbate invasive species such that it would substantially reduce the quality or integrity of the community's occurrence. The proposed action does not involve other processes that are likely to reduce the quality or integrity of Cumberland Plain Woodland other than those described above.

– **Interfere with the recovery of an ecological community**

There is no adopted or made Recovery Plan for this ecological community. However, a Cumberland Plain Recovery Plan has been developed by Department of Environment, Climate Change and Water (NSW) (2010). The proposed action would not interfere with any of the objectives detailed in the Cumberland Plain Recovery Plan or six of the activities outlined to assist recovery. It is likely however to interfere with one listed activity being; protect habitat by minimising further clearing.

## **Conclusion**

The proposed action will impact on up to 0.37 ha of Cumberland Plain Woodland which is consistent the EPBC Act listing. Given the relatively small extent of Cumberland Plain Woodland, the isolated and fragment nature of each patch that will be affected, the impact of the proposed action on this community unlikely to be significant.

## SWIFT PARROT

The Swift Parrot is listed as Critically Endangered under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of Environment, 2013).

**An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will result in one or more of the following:**

- **Lead to a long-term decrease in the size of a population of a species**

Approximately 1.85 ha of potential foraging habitat for Swift Parrot would be affected by the action proposed. While limited habitat in the subject land has the potential to be used by these species, it is not likely to be of high importance due to its relatively small area and the availability of equal or greater quality habitat within the locality and wider region. Any identified population of Swift Parrot in the area would not be restricted to habitat within the subject land. Due to the species' large home range and nomadic nature, similar foraging habitat can be accessed in the locality. Therefore, the action proposed is not considered likely to significantly contribute to a long-term decline in the size of a population for this species.

- **Reduce the area of occupancy of the species**

The action proposed is likely to affect approximately 1.85 ha of potential foraging habitat for this species. Although the action proposed will result in the loss of potential foraging habitat, the incremental loss of a small area of potential habitat, only represents a small component of similar locally occurring resources accessible to these species (<1% in 10km area). Nevertheless, the removal of approximately 1.85 ha of potential habitat is considered to be a small incremental loss of suitable habitat locally and as such has the potential to incrementally reduce the area of occupancy for the Swift Parrot during seasons when individuals of this species may be reliant on local resources.

- **Fragment an existing population into two or more populations**

Habitat connectivity is not likely to be affected by the action proposed. Approximately 1.85 ha of potential foraging habitat is likely to be affected by the action proposed with vegetation removal largely limited to the margins of existing vegetation. As the subject land is small in nature, the proposed action would not further fragment or isolate any previously undisturbed patches of habitat than what already exists due to existing development land use. Furthermore, given that these species are highly mobile and nomadic, the action proposed would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the subject land and locality.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat has been listed for the Swift Parrot to date. The subject land does not occur within the breeding areas (Tasmania) nor is the subject land the only limiting foraging area for this species, as such it is unlikely that this action proposed will adversely affect habitat critical to the survival of this species.

- **Disrupt the breeding cycle of a population**

Swift Parrots breed in Tasmania during spring and summer, migrating to south-eastern Australia during autumn and winter (Department of Environment and Conservation, 2006). While Swift Parrots are dependent on flowering resources across a wide range of habitats (woodlands and forests) within their NSW wintering grounds, the removal of approximately 1.85 ha of potential foraging habitat is unlikely to disrupt their movements to Tasmanian breeding grounds. As such the action proposed is unlikely to affect their breeding cycle.

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

The action proposed would remove approximately 1.85 ha of potential habitat for this species. The removal of approximately 1.85 ha of potential foraging habitat is considered to be an incremental loss of suitable habitat locally, however would only constitute <1% of suitable habitat within 10km<sup>2</sup>. As such the removal of 1.85 ha of potential foraging habitat for the Swift Parrot is unlikely to be at an extent in which these species are likely to decline.

- **Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species' habitat**



It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Swift Parrot would become further established as a result of the action proposed.

– **Introduce disease that may cause the species to decline**

No. It is unlikely that disease would be increased by the action proposed.

– **Interfere with the recovery of the species**

The *Action Plan for Australian Birds* (Garnett and Crowley, 2000) notes pressure on Swift Parrot breeding areas from forestry and firewood collection in Tasmania. On the mainland though pressures relate to the loss of foraging habitats due to clearing for agriculture and residential development (Garnett and Crowley, 2000).

A National Recovery Plan for the Swift Parrot (*Lathamus discolor*) was prepared in 2011 (Saunders, 2011). Recovery actions outlined in this plan include:

- 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.

Based on the impacts of the action proposed on the Swift Parrot, as discussed above, it is likely the action proposed would be in conflict with the second recovery action above, to manage and protect swift parrot habitat at the landscape scale. However, based on the relatively small extent of habitat to be removed it is unlikely that it would significantly affect the recovery of the species.

## Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the subject land is considered to be small in terms of available habitat for the species within region (<1% in 10km<sup>2</sup>). The irregular distribution of blossom resources, which is a key driver of nomadism of these species, may cause this species to occasionally forage within the subject land. Although it is considered unlikely that the loss of potential foraging habitat will cause the local extinction of the Swift Parrot, the action proposed will remove habitat that may be utilised by this species under some intermittent seasonal contexts. The action proposed is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of these species. The action proposed therefore, is considered to represent an incremental loss of available local habitat, although it is not considered likely to have a significant impact as it is unlikely to affect the long-term viability of the species.

## GREY-HEADED FLYING-FOX

The Grey-headed Flying-fox is listed as Vulnerable under the EPBC Act. The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

### Is this part of an important population?

Grey-headed Flying-foxes occur across a range of wooded habitats where their favoured food, eucalypt blossom occurs. They set up roosting camps in association with blossom availability, which are usually situated in dense vegetation and associated with water. Grey-headed Flying-foxes can migrate up to 75 km north during the winter and during this time young flying-foxes establish camps.

The subject land does not contain suitable habitat for roosting camps and such habitat does not occur within its close vicinity. Therefore, a population of Grey-headed Flying-fox in the subject land is not considered to be important, as no roost sites would be affected by the proposed action.

### An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

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

Not applicable. Grey-headed Flying-fox occurring in the in the subject land is not part of an important population.

- **Reduce the area of occupancy of an important population of the species**

Not applicable. Grey-headed Flying-fox occurring in the in the subject land is not part of an important population.

- **Fragment an existing important population into two or more populations**

Not applicable. Grey-headed Flying-fox occurring in the in the subject land is not part of an important population.

- **Adversely affect habitat critical to the survival of a species**

No critical habitat is listed for this species under the EPBC Act.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The action proposed would remove about 1.85 ha of suitable foraging habitat for this species. As this species is highly mobile, with individuals foraging up to 50 km from roost sites, it is likely that suitable foraging resources could be accessed in the locality. Therefore, this would not meet the above criteria.

- **Disrupt the breeding cycle of an important population**

Not applicable. Grey-headed Flying-fox occurring in the in the subject land is not part of an important population.

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

No. The action proposed would only affect approximately 1.85 ha of suitable foraging habitat for this species. As this species is known to forage up to 50 km from roost sites, the action proposed is not likely to significantly affect the availability of quality habitat for this species.

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

It is not likely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become further established as a result of the proposed action.

- **Introduce disease that may cause the species to decline**

No. There are no known diseases that are likely to increase in the area as a result of the proposed action.

- **Interfere with the recovery of the species**

Due to the limited foraging habitat likely to be affected by the proposed action (about 1.85 ha) and as no roost camps are located in the vicinity of the subject land, the action proposed is not likely to interfere with the recovery of this species.

## Conclusion

The Grey-headed Flying-fox frequents habitats that contain eucalypt blossom and native fruits such as figs, which are their favoured foods. The subject land contains eucalypt dominated community, this includes those eucalypt species that are favoured by this species. A small amount of potentially suitable foraging habitat (1.85 ha) will be affected by the action proposed, although this is unlikely to be significant to local populations, due to the abundance of similar and greater quality foraging habitat elsewhere within the subject land and in the wider locality. There were no Grey-headed Flying-fox camps within the subject land or its vicinity, but there are camps in the wider region. Therefore, habitat attributes occurring within the subject land are not considered important to the long-term survival of the Grey-headed Flying-fox.

## REFERENCES

- Department of Environment 2013. Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. *In*: Environment, D. O. (ed.). Canberra, ACT: Commonwealth of Australia.
- Department of Environment and Conservation. 2006. *Threatened species, populations and ecological communities* [Online]. Hurstville: NSW Department of Environment and Conservation. Available: <http://www.threatenedspecies.environment.nsw.gov.au/index.aspx> [Accessed 2006].
- Department of Environment Climate Change and Water 2010. Cumberland Plain Recovery Plan. *In*: Department of Environment, C. C. A. W. (ed.). Sydney: Department of Environment, Climate Change and Water.
- Department of the Environment 2013. Matters of National Environmental Significance, Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999. *In*: Environment, D. O. (ed.). Canberra, ACT: Commonwealth of Australia.
- Garnett, S. T. & Crowley, G. M. 2000. *The Action Plan for Australian Birds*, Canberra, Environment Australia.
- Saunders, D. A., Tzaros, C., 2011. National Recovery Plan for the Swift Parrot *Lathamus discolor*. Melbourne: Birds Australia.



# APPENDIX F

## RIPARIAN ASSESSMENT



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# RIPARIAN IMPACT ASSESSMENT

## F1.1 RIPARIAN CORRIDOR MANAGEMENT OBJECTIVES

The main objective for riparian corridor management is to establish and preserve the integrity of the riparian corridor. This will involve maintaining and rehabilitating native riparian vegetation and ensuring any recreational use (footpath or cycleway) is designed within the outer 50% of the corridor and is constructed using permeable surfaces and materials that preserve riparian integrity.

The final riparian corridor configuration will be subject to further refinement although an average corridor width of 20 metres from the top of the bank is the design objective.

The principles or desired outcomes for riparian corridor management of Elizabeth Macarthur Creek is to:

- provide bed and bank stability and reduce bank and channel erosion
- protect water quality by trapping sediment, nutrients and other contaminants
- provide diversity of habitat for terrestrial, riparian and aquatic plants (flora) and animals (fauna)
- provide connectivity between wildlife habitats
- convey flood flows and controlling the direction of flood flows
- provide an interface or buffer between developments and waterways
- provide passive recreational uses.

## F1.2 RIPARIAN CORRIDOR WIDTHS

Elizabeth Macarthur Creek is a 2nd order waterway under the Strahler stream ordering system and as such the BAM identifies the riparian buffer distance is 20 metres on each side of the waterway from the top of bank (Office of Environment & Heritage 2017). This riparian corridor width for a 2nd order stream is consistent with recommended riparian corridor widths outlined under the Guidelines for riparian corridors on waterfront land (NSW Office of Water 2012).

The riparian corridor is defined as:

- the channel which comprises the bed and banks of the watercourse (top of bank) and
- the vegetated riparian zone adjoining the channel.

## F1.3 RIPARIAN CORRIDOR MATRIX

In terms of the Bella Vista Station Precinct it is noted that any controlled activity approval under *Water Management Act 2000* (WM Act) can consider allowable non-riparian corridor works or development to be permitted in the riparian corridor. These uses and activities are outlined in the riparian corridor matrix which has been designed to provide more flexibility in how riparian corridors can be used and make it easier for applicants to design riparian management for Office of Water controlled activity approval that establish and preserve the integrity of the riparian corridor (Table 14.1).

Table 14.1 Riparian corridor matrix

| Stream order      | Vegetated Riparian Zone (VRZ) | RC off-setting for non RC uses | Cycleways and paths | Detention basins          |        | Stormwater outlet structures and essential services | Stream realignment | Road crossings |         |        |
|-------------------|-------------------------------|--------------------------------|---------------------|---------------------------|--------|-----------------------------------------------------|--------------------|----------------|---------|--------|
|                   |                               |                                |                     | Only within 50% outer VRZ | Online |                                                     |                    | Any            | Culvert | Bridge |
| 1 <sup>st</sup>   | 10m                           | •                              | •                   | •                         | •      | •                                                   | •                  | •              |         |        |
| 2 <sup>nd</sup>   | 20m                           | •                              | •                   | •                         | •      | •                                                   |                    | •              |         |        |
| 3 <sup>rd</sup>   | 30m                           | •                              | •                   | •                         |        | •                                                   |                    |                | •       | •      |
| 4 <sup>th</sup> + | 40m                           | •                              | •                   | •                         |        | •                                                   |                    |                | •       | •      |

Source: NSW Office of Water, 2012

KEY:

**Stream order:** The watercourse order as classified under the Strahler System based on 1:25,000, 1:50,000 or 1:100,000 topographic maps whichever is the smallest scale available. A full list is provided at Part 2, Schedule 2 of the Water Management (General) Regulation 2011.

**Vegetated riparian zone (VRZ):** The required width of the VRZ measured from the top of the high bank on each side of the watercourse.

**Riparian corridor (RC):** off-setting for non RC uses: Non-riparian uses, such as Asset Protection Zones are allowed within the outer 50 per cent of the VRZ, so long as offsets are provided in accordance with the averaging rule.

**Cycleways and paths:** Cycleways or paths no wider than four metres total disturbance footprint can be built in the outer 50 per cent of the VRZ.

**Detention basins:** Detention basins can be built in the outer 50 per cent of the VRZ or online where indicated. Refer to the Office of Water's Controlled activities. Guidelines for outlet structures and Controlled activities. Guidelines for instream works. Online basins must:

- be dry and vegetated
- be for temporary flood detention only with no permanent water holding
- have an equivalent VRZ for the corresponding watercourse order
- not be used for water quality treatment purposes.

**Stormwater outlet structures and essential services:** Stormwater outlets or essential services are allowed in the RC. Works for essential services on a fourth order or greater stream are to be undertaken by directional drilling or tied to existing crossings. Refer to the Office of Water's Controlled activities.

*Guidelines for laying pipes and cables in watercourses and Controlled activities. Guidelines for outlet structures.*

**Stream realignment:** Indicates that a watercourse may be realigned. Refer to the Office of Water's Controlled activities. Guidelines for instream works.

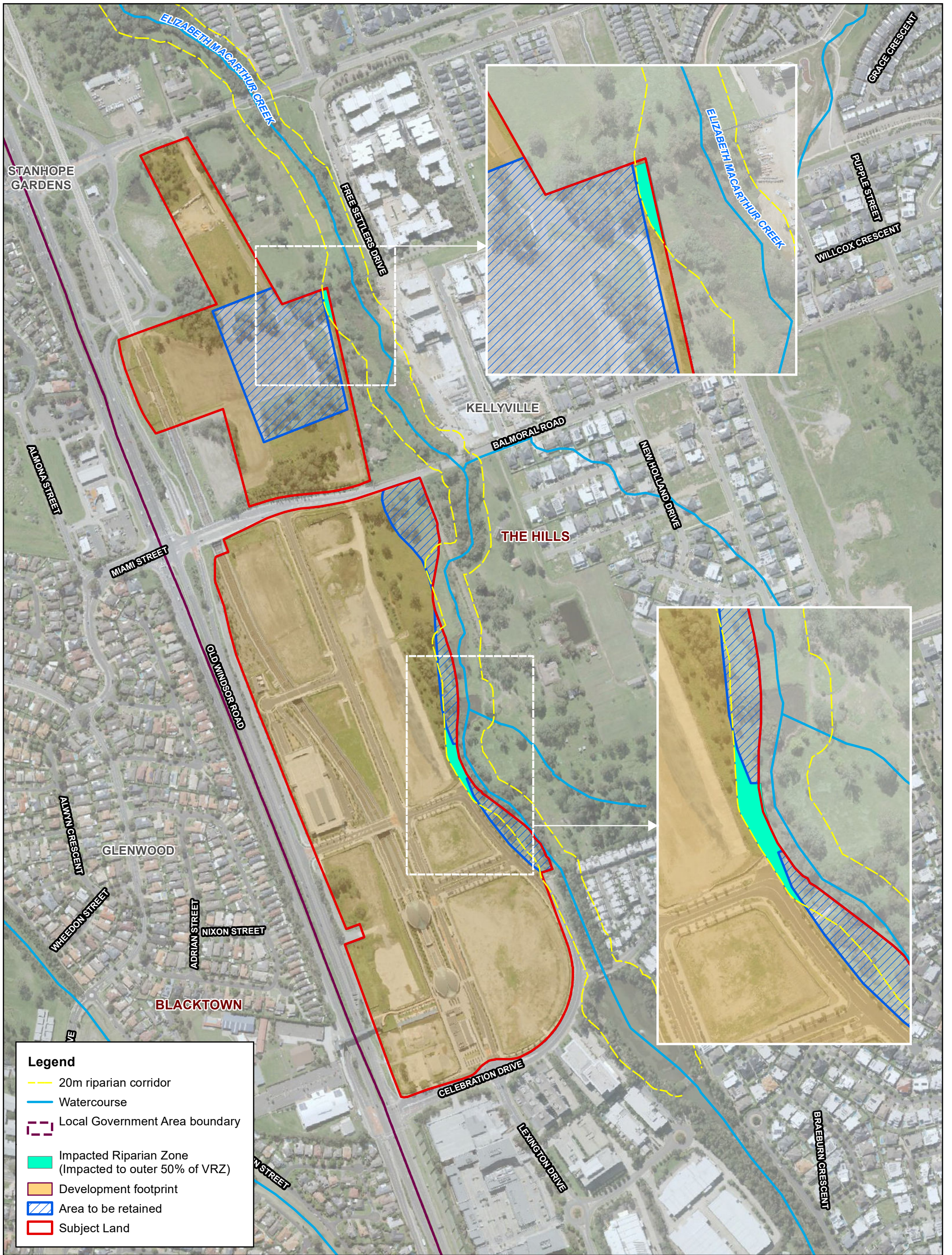
**Road crossings:** Indicates permitted road crossing methods. Refer to the Office of Water's Controlled activities. Guidelines for watercourse crossings and NSW DPI policy and guidelines for fish friendly waterway crossings for Class 1 and 2 waterways.

## F1.4 RIPARIAN CORRIDOR ASSESSMENT

An overlay of the project development footprint and the applied riparian corridor for Elizabeth Macarthur Creek is presented in Figure F.1. The impact assessment identified that three minor encroachments occur within the outer 50 per cent of the corridor. These encroachments equate to an overall area of 0.17 ha impact. Given the minor nature of these

encroachments it is considered the current Bella Vista Station Precinct concept design can allow for offsetting this impact through applying the averaging rule and average back the required riparian corridor width.





**Bella Vista Station Precinct**

**Figure F.1**  
Riparian Impact Assessment



## F1.5 MITIGATION MEASURES

Mitigation measures recommended as in the Riparian Assessment for the Kellyville Station Precinct Concept Proposal (EcoLogical, 2019) relevant to the Bella Vista Station Precinct have been listed below and recommended to manage and lower the risk associated with the 0.17 ha impacted by the project. Mitigation measures include:

- The Construction Environmental Management Plan (CEMP) prepared should include a Sediment and Erosion Control Plan, prepared in accordance with The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom, 2004) and implemented prior to works
- Higher-disturbance activities (such as noisy machinery, flood lights, generators and compounds) be located as far from the riparian buffer as practically possible
- Sediment fences to slow overland flow and trap sediments created from surface erosion
- Identify opportunities for re-use of water from any dewatering activities on-site such as dust suppression
- Where excess water from the construction site or during operation of the project is to be released into Elizabeth Macarthur Creek, constructed storage ponds should be used to first capture and settle the water before discharge.
- Rehabilitation and revegetation of riparian corridor within the project boundary
- Water Quality Monitoring - Water released into Elizabeth Macarthur Creek needs to comply with requirements of the Protection of the Environment Operations Act 1997. At a minimum, water quality should mimic or improve on that in the creek. Differences in water quality will be diluted further downstream. The creation of a water quality monitoring plan should be prepared to enable ongoing monitoring of waterway health.

Given the small area of impact (0.17 ha) and the application of the averaging rule (section F1.4), a land-based offset is not considered necessary.

# APPENDIX G

## BDAR REQUIREMENTS



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# BDAR REQUIREMENTS

This section provides the information requirements for the Biodiversity Assessment Development Report as outlined in Table 25 and Table 26 of the BAM and required under section 6.12 (a) of the BC Act. Where information requirement has been provided in this report is detailed in Table 14.2 with map and data requirements addressed in Table 14.3



Table 14.2 Information requirements of a BDAR and section addressed in this report

| INFORMATION REQUIREMENT                                                                                           | SECTION IN THIS REPORT     |
|-------------------------------------------------------------------------------------------------------------------|----------------------------|
| Introduction to the biodiversity assessment including:                                                            |                            |
| Identification of development site footprint including:                                                           | Section 1.2.2, Figure 1.2  |
| — operational footprint                                                                                           |                            |
| — construction footprint indicating clearing associated with temporary construction facilities and infrastructure |                            |
| General description of development site                                                                           | Section 1.2                |
| Sources of information used in the assessment, including reports and spatial data                                 | Section 3.3                |
| Landscape features                                                                                                |                            |
| Identification of landscape features at the development/biodiversity stewardship site, including:                 | 1 Section 4, Table 4.1     |
| 1 IBRA bioregions and subregions, NSW landscape region and area (ha)                                              | 2 Section 4, Table 4.2     |
| 2 Native vegetation extent in the buffer area                                                                     | 3 Section 5, Section 5.3   |
| 3 Cleared areas                                                                                                   | 4 Not applicable           |
| 4 Evidence to support differences between mapped vegetation extent and aerial imagery                             | 5 section 4, section 4.1.1 |
| 5 Rivers and streams classified according to stream order                                                         | 6 Section 4, Table 4.1     |
| 6 Wetlands within, adjacent to and downstream of the site                                                         | 7 Section 4, Table 4.1     |
| 7 Connectivity features                                                                                           | 8 Section 4, Table 4.1     |
| 8 Areas of geological significance and soil hazard features                                                       |                            |
| Site context components, including:                                                                               | Section 4, Section 4.2     |
| ○ identification of method applied (i.e. linear or site-based)                                                    |                            |
| ○ percent native vegetation cover in the landscape                                                                |                            |
| Native vegetation                                                                                                 |                            |

| INFORMATION REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SECTION IN THIS REPORT                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Identify native vegetation extent within the development site, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery.                                                                                                                                                                                                                                                                                                                                                                   | Section 5, Table 5.1                                                                                                                                                                 |
| Describe PCTs within the development site including: <ul style="list-style-type: none"> <li>— vegetation class</li> <li>— vegetation type</li> <li>— area (ha) for each vegetation type</li> <li>— species relied upon for identification of vegetation type and relative abundance</li> <li>— justification of evidence used to identify a PCT</li> <li>— TEC status</li> <li>— estimate of percent cleared value of PCT</li> </ul>                                                                                                              | Section 5, Table 5.1<br><br>Species relied upon for identification of vegetation type and relative abundance and PCT justification is provided in Table 5.2, Table 5.4 and Table 5.6 |
| Perform a vegetation integrity assessment of the development site, including: <ol style="list-style-type: none"> <li>1 mapping vegetation zones</li> <li>2 patch size</li> <li>3 assessing vegetation integrity using benchmark data</li> <li>4 survey effort (number of plots)</li> <li>5 determining the vegetation integrity score: <ul style="list-style-type: none"> <li>— composition condition score</li> <li>— structure condition score</li> <li>— function condition score</li> <li>— vegetation integrity score</li> </ul> </li> </ol> | 1 Table 5.1<br>2 Table 5.1<br>3 Table 5.3, Table 5.5 and Table 5.7<br>4 Section 3, Table 3.6<br>5 Table 5.2, Table 5.4 and Table 5.6                                                 |
| Threatened species                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                      |

| INFORMATION REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SECTION IN THIS REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Identify ecosystem credit species associated with PCTs the development site including:</p> <ul style="list-style-type: none"> <li>— list of species derived</li> <li>— justification for exclusion of any ecosystem credit species predicted above.</li> </ul>                                                                                                                                                                                                                                                        | <p>Predicted (ecosystem credit) species considered as part of this assessment are outlined in section 6.2.1 and Table 6.2.</p> <p>Justification for the exclusion of any ecosystem species predicted is provided in Appendix B.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>Identify species credit species on the development site including:</p> <ul style="list-style-type: none"> <li>— list of candidate species</li> <li>— justification for inclusions and exclusions based on habitat features</li> <li>— indication of presence based on targeted survey or expert report</li> <li>— details of targeted survey technique, effort, timing and weather</li> <li>— species polygons</li> <li>— biodiversity risk weighting for the species</li> <li>— threatened species survey</li> </ul> | <p>Candidate (species credit) species considered as part of this assessment are outlined in section 6.2.1 and Table 6.3.</p> <p>Justification for the exclusion of any species predicted is provided in Table 3.8 for threatened fauna. Appendix A and Appendix B for all threatened species with habitat features outlined and considered.</p> <p>Threatened species survey effort (including technique and timing) is provided in Table 3.7 for threatened flora and Table 3.9 for threatened fauna. Weather during the survey period if outlined in Table 3.4. Results of survey are outlined in Table 6.1 for threatened flora and Table 6.3 for threatened fauna (candidate/species credit species).</p> <p>Species polygons for those species considered affected is shown in Figure 6.1 and quantified in Table 11.2. Biodiversity risk weighting is outlined in Table 11.1 for ecosystem credits and Table 11.2 for species credits.</p> |
| Avoid and minimise impacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Demonstration of efforts to avoid and minimise impact on biodiversity values.                                                                                                                                                                                                                                                                                                                                                                                                                                            | Section 8 and Table 8.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Assessment of direct and indirect impacts unable to be avoided at the development site. The assessment would include but not be limited to: type, frequency, intensity, duration and consequence of impact.                                                                                                                                                                                                                                                                                                              | Section 9 and Table 9.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Impact summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Identification and an assessment of the impacts which are potential serious and irreversible impacts, in accordance with Subsections 10.2.2 for impacts on CEECs and 10.2.3 for threatened species.                                                                                                                                                                                                                                                                                                                      | Section 9.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| INFORMATION REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SECTION IN THIS REPORT                                                             |
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| Identification of impacts requiring offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Section 11.1, Figure 11.1                                                          |
| Identification of impacts not requiring offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Section 11.1                                                                       |
| Identification of areas not requiring assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Section 9.7, Figure 9.3                                                            |
| <p>Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:</p> <ul style="list-style-type: none"> <li>— future vegetation integrity score for each vegetation zone at the development site</li> <li>— change in vegetation integrity score</li> <li>— number of required ecosystem credits for the impact of development on each vegetation zone at a development site + number of required species credits for each threatened species that is impacted on by development</li> </ul> | Section 11.1.2 for ecosystem credits and section 11.1.3 for species credit species |
| Biodiversity credit report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                    |
| Credit classes for ecosystem credits and species credits at the development site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Appendix D                                                                         |



Table 14.3 Maps and data requirements of a BDAR and section addressed within this report

| RELEVANT SECTION   | MAPS AND DATA REQUIREMENTS                                                                                                                                                                                        | SECTION IN THIS REPORT                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Introduction       | Site Map                                                                                                                                                                                                          | Figure 1.1                                         |
|                    | Location Map                                                                                                                                                                                                      | Figure 1.2                                         |
|                    | Digital shape files for all maps and spatial data                                                                                                                                                                 | Provided on request                                |
| Landscape features | IBRA bioregions and subregions                                                                                                                                                                                    | Figure 4.1 and Table 4.1                           |
|                    | NSW landscape regions                                                                                                                                                                                             | Figure 4.1 and Table 4.1                           |
|                    | Rivers and streams                                                                                                                                                                                                | Figure 4.1 and Table 4.1                           |
|                    | Wetlands                                                                                                                                                                                                          | Figure 4.1 and Table 4.1                           |
|                    | Connectivity of different areas of habitat                                                                                                                                                                        | Table 4.1                                          |
|                    | Areas of geological significance and soil hazard features                                                                                                                                                         | Table 4.1                                          |
|                    | Native vegetation extent                                                                                                                                                                                          | Figure 4.2 and Table 4.2                           |
| Native vegetation  | Map of native vegetation extent within the development site                                                                                                                                                       | Figure 5.1                                         |
|                    | Map of PCTs within the development site                                                                                                                                                                           | Figure 5.1                                         |
|                    | Map of plot locations relative to PCTs                                                                                                                                                                            | Figure 5.1                                         |
|                    | Map of TECs                                                                                                                                                                                                       | Figure 6.1                                         |
|                    | Plot field data (MS Excel format)                                                                                                                                                                                 | Appendix C                                         |
|                    | Plot field data sheets                                                                                                                                                                                            | Data was collected digitally during field surveys. |
|                    | Patch size of intact native vegetation                                                                                                                                                                            | Table 5.1                                          |
|                    | Table of current vegetation integrity scores for each vegetation zone within the development site.                                                                                                                | Table 5.1                                          |
| Threatened species | Table of habitats or habitat components and their sensitivity classes                                                                                                                                             | Table 11.1 and Table 11.2                          |
|                    | Table detailing the list of species credit species and presence status on site as determined by targeted survey, indicating also where presence was assumed and/or where presence was determined by expert report | Table 6.1 and Table 6.3                            |
|                    | Species credit species polygons                                                                                                                                                                                   | Table 11.2 and Figure 6.1                          |

| RELEVANT SECTION           | MAPS AND DATA REQUIREMENTS                                                                                                                                                       | SECTION IN THIS REPORT                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | Table detailing species and habitat feature/component associated with species and its abundance on site                                                                          | Table 3.8 provides justification for those threatened fauna species dismissed based on the absence of habitat features/components. Threatened flora and fauna species are detailed in Appendix A and Appendix B |
|                            | Table detailing biodiversity risk weighting for species on site                                                                                                                  | Table 11.1 and Table 11.2                                                                                                                                                                                       |
| Avoid and minimise impacts | Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project, including action, outcome, timing and responsibility | Table 10.1                                                                                                                                                                                                      |
|                            | Map of final project footprint including construction and operation                                                                                                              | Figure 9.1                                                                                                                                                                                                      |
|                            | Maps demonstrating indirect impact zones where applicable                                                                                                                        | Indirect impacts are general and detailed in 9.1.4.                                                                                                                                                             |
| Impact summary             | Map showing the location of serious and irreversible impacts                                                                                                                     | Figure 9.2                                                                                                                                                                                                      |
|                            | Map of impacts requiring offset                                                                                                                                                  | Figure 11.1                                                                                                                                                                                                     |
|                            | Map of impacts not requiring offset                                                                                                                                              | Not applicable – All impacts to biodiversity assessed requires offset. This is discussed in section 11.1.1                                                                                                      |
|                            | Map of areas not requiring assessment                                                                                                                                            | Figure 9.3                                                                                                                                                                                                      |
|                            | Table of PCTs requiring offset and the number of ecosystem credits required                                                                                                      | Table 11.1                                                                                                                                                                                                      |
|                            | Table of threatened species requiring offset and the number of species credits required                                                                                          | Table 11.2                                                                                                                                                                                                      |
| Biodiversity credit report | Submitted proposal in the Credit Calculator                                                                                                                                      | Can be provided on request                                                                                                                                                                                      |
|                            | Table of credit class and matching credit profile                                                                                                                                | Appendix D                                                                                                                                                                                                      |

