SYDNEY FOOTBALL STADIUM REDEVELOPMENT

STATE SIGNIFICANT DEVELOPMENT APPLICATION

Concept Proposal and Stage 1 Demolition

SSDA 9249

APPENDIX Q:

Biodiversity Development Assessment Report

NSW GOVERNMENT

Concept Proposal and Demolition Sydney Football Stadium

Infrastructure NSW

Biodiversity Development Assessment Report

1 | Final

24 May 2018

Concept Proposal and Demolition Sydney Football Stadium

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Contents

Glossary of terms

Definitions

Biodiversity credits	Ecosystem credits or species credits
Biodiversity credit report	The report produced by the Biodiversity Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.
Biodiversity Credit Calculator (BCC)	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to the project SEARs for cumulative impact assessment requirements.
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
Direct impact	An impact on biodiversity values that is a direct result of vegetation clearance and loss of habitat for a development. It is predictable, usually occurs at or near to the development site and can be readily identified during the planning, design, construction, and operational phases of a development.
Ecosystem credit	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
Ecosystem credit species	A measurement of the value of threatened species habitat for species that can be reliably predicted to occur with a PCT.
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.
Indirect impact	An impact on biodiversity values that occurs when development related activities affect threatened species, threatened species habitat, or ecological communities in a manner other than direct impact. Compared to direct impacts, indirect impacts often: · occur over a wider area than just the site of the development · have a lower intensity of impact in the extent to which they occur compared to direct impacts · occur off site · have a lower predictability of when the impact occurs · have unclear boundaries of responsibility.
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area and/or a population occupies part of the study area, impacts on the entirety of each population must be assessed separately.
MNES	A matter of national environmental significance (MNES) protected by a provision of Part 3 of the EPBC Act
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1: 250,000.
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality.
Population	A group of organisms, all of the same species, occupying a particular area.
Project area/ Project site	The area of land that is directly impacted on by a proposed Major Project that is under the EP&A Act, including access roads, and areas used to store construction materials.
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. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Species credit species	Threatened species that are assessed according to Section 6.4 of the BAM
Subject land	Land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Study area	The subject land and any other areas surveyed and assessed for biodiversity values which may be subject to indirect impacts.
Target species	A species that is the focus of a study or intended beneficiary of a conservation action or connectivity measure.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website at www.bionet.nsw.gov.au.

Abbreviations

BAM	Biodiversity Assessment Method
BCC	Biodiversity Credit Calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BDAR	Biodiversity Development Assessment Report
CEMP	Construction Environmental Management Plan
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Federal)
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSI	State Significant Infrastructure
TECs	Threatened Ecological Communities
VIS	Vegetation information system (BioNet Vegetation Classification)

Executive Summary

This document is the Biodiversity Development Assessment Report (BDAR) that supports a State Significant Development (SSD) Development Application (DA) for the redevelopment of the Sydney Football Stadium which is submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). A staged approach to the planning applications is proposed which includes:

- Stage 1 – Concept Proposal for the stadium envelope and supporting retail and functional uses as well as development consent for the carrying out of early works, including demolition of the existing facility and associated structures.
- Stage 2 – detailed design, construction and operation of the stadium and supporting business, retail and functional uses.

This BDAR relates to the Stage 1 Concept DA and detailed Early Works package. Infrastructure NSW is the Proponent for the Stage 1 planning application.

The Biodiversity Offset Scheme (BOS) applies to SSD projects unless the Secretary of the Department of Planning and Environment and the Chief Executive of OEH determine that the project is not likely to have a significant impact. This document is the BDAR for the project as required under the Biodiversity Assessment Method (BAM). This BDAR documents the results of the biodiversity assessment undertaken for the project in line with the relevant State and Commonwealth environmental and threatened species legislation and policy. This BDAR addresses Stage 1 and Stage 2 of the BAM.

The development site and study area have been comprehensively modified from their original state. As such, the field methods outlined in the BAM were not able to be implemented to the full extent. There is some native vegetation (according to the definition of native vegetation provided in the *Local Land Services Act 2013*) that has been planted in the development site. However, this native vegetation is not naturally occurring and cannot be assigned to a Plant Community Type (PCT) as identified in the OEH BioNet Vegetation Classification. As such, the vegetation cannot be allocated to vegetation zones. As the native vegetation cannot be assigned to a PCT, it was not possible to assess vegetation integrity by undertaking an assessment of the composition, structure or function of the vegetation according to the field methods outlined in the BAM. A vegetation integrity score could not be determined as there are no PCTs that will be impacted. There are no threatened ecological communities located in or directly adjacent to the development site.

As the native vegetation in the development site is not naturally occurring and cannot be assigned to a PCT, there is no PCT that can be used as a habitat surrogate and it is not possible for development of the site to generate an ecosystem credit requirement. Species credit species have been assessed in conjunction with information collected about the site context of the subject land, the habitat on site, and data obtained from the Threatened Biodiversity Data Collection. The candidate species identified during this assessment do not have suitable habitat in the development site and are unlikely to be impacted. There are unlikely to be any significant impacts to any threatened or migratory species listed as a Matter of National Environmental Significance.

While there are no impacts that would generate a biodiversity credit requirement, there will be some impacts that nonetheless require assessment and mitigation. These impacts are referred to in the BAM as prescribed impacts and relate to impacts on human made structures, non-native (non-PCT) vegetation, habitat connectivity and species movement. The assessment has concluded that the effects of the prescribed impacts are minor.

When the thresholds for the assessment and offsetting of impacts of development are considered, an offset requirement for ecosystem credits cannot be calculated in accordance with Chapter 11 of the BAM as no PCTs are present on the development site. Likewise, an offset requirement for species credit species cannot be calculated in accordance with Chapter 11 of the BAM. No ecosystem or species credits are required.

Overall, the biodiversity impacts of the project are considered to be minor. Importantly, there are no impacts on a potential entity that are serious and irreversible impacts.

Important note about your report

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by Infrastructure NSW and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from Infrastructure NSW (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the Proposal and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and Infrastructure NSW. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

1.1 Project background

The NSW Stadia Strategy 2012 provides a vision for the future of stadia within NSW, prioritising investment to achieve the optimal mix of venues to meet community needs and to ensure a vibrant sports and event environment in NSW. A key action of the strategy included development of master plans for Tier 1 stadia and their precincts covering transport, integrated ticketing, spectator experience, facilities for players, media, restaurant and entertainment provision. The Sydney Football Stadium (SFS) is one of three Tier 1 stadia within NSW.

In a competitive rectangular stadium landscape nationally, the existing SFS is facing serious commercial and operational challenges in remaining relevant and competitive for existing and future hirers and patrons. Owing to the age of SFS, there are a number of deficiencies in the provision of facilities that are required to function as a modern and competitive Tier 1 stadium. The stadium has aged poorly and fails to meet modern expectations of a Tier 1 stadium in terms of patron experience, crowd management, safety/security, accessibility, facilities for hirers, operational efficiency, premium hospitality and food/beverage offerings, and media requirements.

On 24 November 2017, the NSW Premier announced the SFS Redevelopment. The redevelopment will include demolition of the existing facility and replacement with a modern, globally competitive stadium that achieves the requirements for a Tier 1 stadium to meet future requirements.

The SFS Redevelopment will create a new stadium with up to 45,000 seats through a range of seating and facilities. The stadium will include state of the art technology with digital screens throughout to improve the fan experience. Sightlines will be improved and facilities including catering, public amenities and accessibility will be designed to service current and future needs, creating a world-class customer experience.

1.2 Legislative context and SEARs

Environmental Impacts Statements (EISs) are prepared to assess the impacts of major projects, including State Significant Development (SSD) projects, under Part 4.1 of the EP&A Act. This biodiversity assessment forms part of the EIS being prepared for the project and assesses the biodiversity impacts of the project.

The Sydney Football Stadium Redevelopment is State Significant Development (SSD) under the *Environmental Planning and Assessment Act 1979* (EP&A Act) due to the provisions of State Environmental Planning Policy (State and Regional Development) 2011 as it is development for the purpose of a 'recreation facility (major)' with a capital investment value (CIV) of more than $30 million (Schedule 1) and is also development at the Sydney Sports Stadiums Site with a CIV of more than $10 million (Schedule 2). The estimated CIV for the project is $705 million (subject to tendering processes).

A staged application for the project is proposed which includes:

- Stage 1 – Concept Proposal for the stadium envelope and supporting retail and functional uses as well as development consent for the carrying out of early works comprising demolition of the existing facility and associated structures.
- Stage 2 – detailed design, construction and operation of the stadium and supporting business, retail and functional uses.

This report relates only to Stage 1, the submission of a Concept Development Application incorporating detailed proposals for early works pursuant to Section 83B of the EP&A Act.

The biodiversity requirements of the SEARs are as follows:

> Assess and document the flora and fauna impacts related to the concept proposal envelope, including basement, by a suitably qualified person. Note: Notwithstanding these requirements, the *Biodiversity*

Conservation Act 2016 requires that State Significant Development Applications be accompanied by a Biodiversity Development Assessment Report.

1.3 Objectives

The Biodiversity Offsets Scheme (BOS) applies to SSD projects unless the Secretary of the Department of Planning and Environment and the Chief Executive of OEH determine that the project is not likely to have a significant impact. This document is the Biodiversity Development Assessment Report (BDAR) for the project as required under the Biodiversity Assessment Method (BAM). This BDAR documents the results of the biodiversity assessment undertaken for the project in line with the relevant State and Commonwealth environmental and threatened species legislation and policy. This BDAR has been prepared by Lukas Clews (accreditation number BAAS17060), a person accredited under Section 6.10 of the *Biodiversity Conservation Act 2016* (BC Act) as a Biodiversity Assessment Method Assessor to apply the BAM in connection with the preparation of Biodiversity Stewardship Site Assessment Reports, BDARs, and Biodiversity Certification Assessment Reports pursuant to Part 6 of the BC Act.

The BAM is structured around three primary stages:

- Stage 1 - Biodiversity assessment.
- Stage 2 - Impact assessment (biodiversity values and prescribed impacts).
- Stage 3 – Improving biodiversity values.

This BDAR consists of Stage 1 and Stage 2 of the BAM. Stage 3 is only applicable for the purposes of an application for a biodiversity stewardship agreement so is not covered in this BDAR.

1.4 Site location and study area

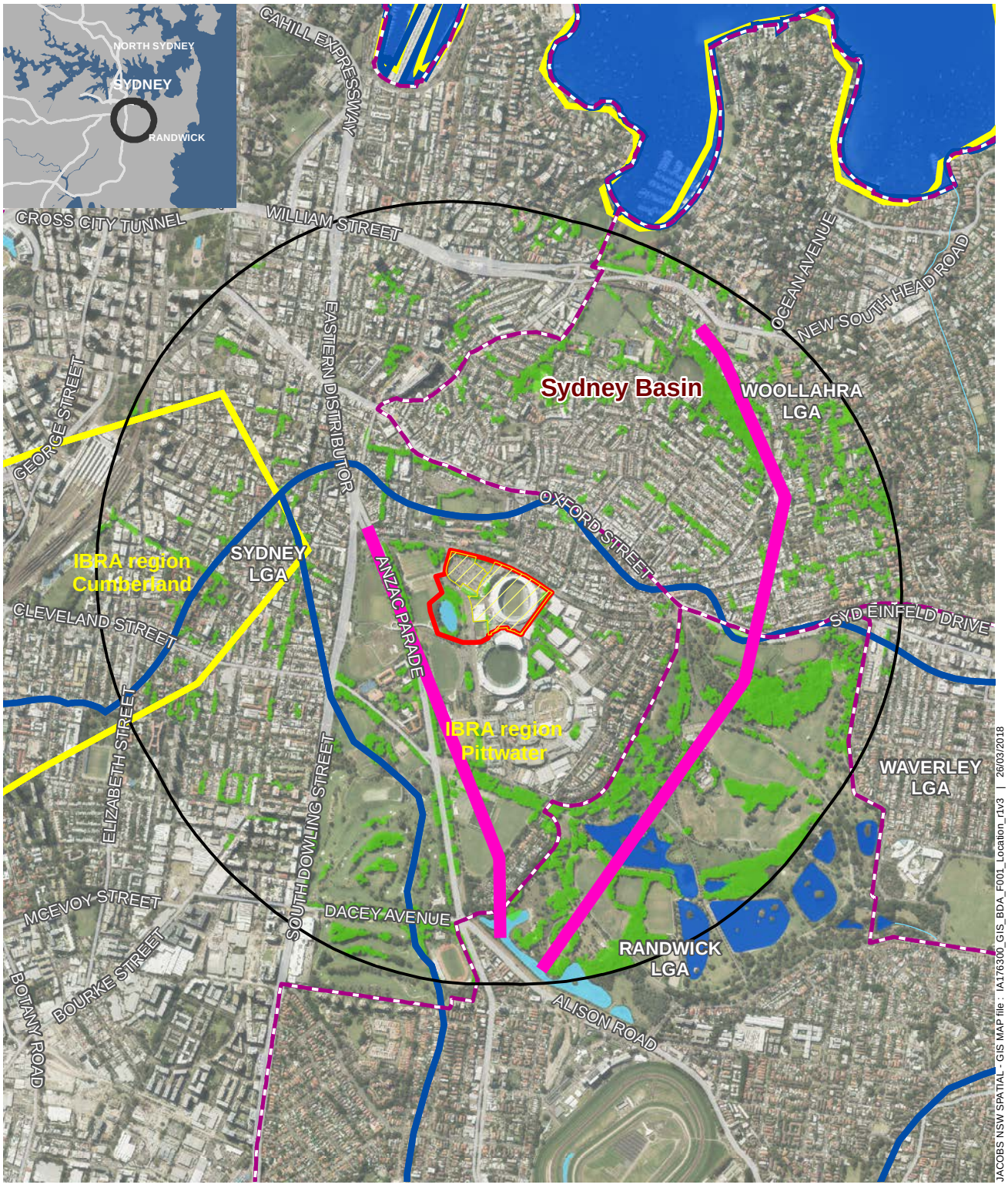
The development site is located at 40-44 Driver Avenue Moore Park within the Sydney Cricket Ground Precinct (see Figure 1.1 and Figure 1.2). It is bound by Moore Park Road to the north, Fox Studios to the east, the existing Sydney Cricket Ground to the south and Driver Avenue to the west. The development site is located within the City of Sydney local government area and is wholly contained within designated land controlled by the Sydney Cricket and Sports Ground Trust (SCSGT).

The site is largely surrounded by Centennial and Moore Parks, the Fox Studios and Entertainment Quarter precincts and the residential suburb of Paddington. Located approximately 3km from the Sydney CBD and approximately 2km from Central Station, the site is connected to Sydney's transport network through existing bus routes and will benefit from a dedicated stop on the soon to be completed Sydney CBD and South East Light Rail.

The study area for the purposes of this biodiversity assessment (see Figure 1.2) includes the area of the existing SFS and adjacent land to the boundary with Moore Park Road, the Fox Studios and Entertainment Quarter precincts, the SCG, and Driver Avenue. A construction area is located in the current carpark at the corner of Driver avenue and Moore Park Road (see Figure 1.2).

The following areas are discussed throughout the report and are defined as:

- Development footprint: this area comprises the limits of the construction footprint and compound site locations (see Figure 1.2). The development footprint includes the construction footprint, compound sites, stockpile sites and any other areas that would be temporarily disturbed. Also known as the 'subject land'.
- Study area: includes the development footprint and surrounding area (see Figure 1.2) that may be used for site access. The study area includes some areas outside of the development footprint including the area around Kippax Lake.
- Locality: This is defined as the area within a 10 kilometre radius surrounding the proposal footprint.
- Bioregion: The study area is located in the Sydney Basin bioregion (Thackway and Cresswell 1995) and within the Cumberland sub-region.



Legend

- Study area
- Development site
- 1500m buffer
- LGA boundary
- Habitat connectivity
- Vegetation
- IBRA subregion (OEH)

Strahler stream order (DPI)

- 1
- Estuaries
- Wetlands
- Water body

0 500 1000m
1:25,000 @ A4

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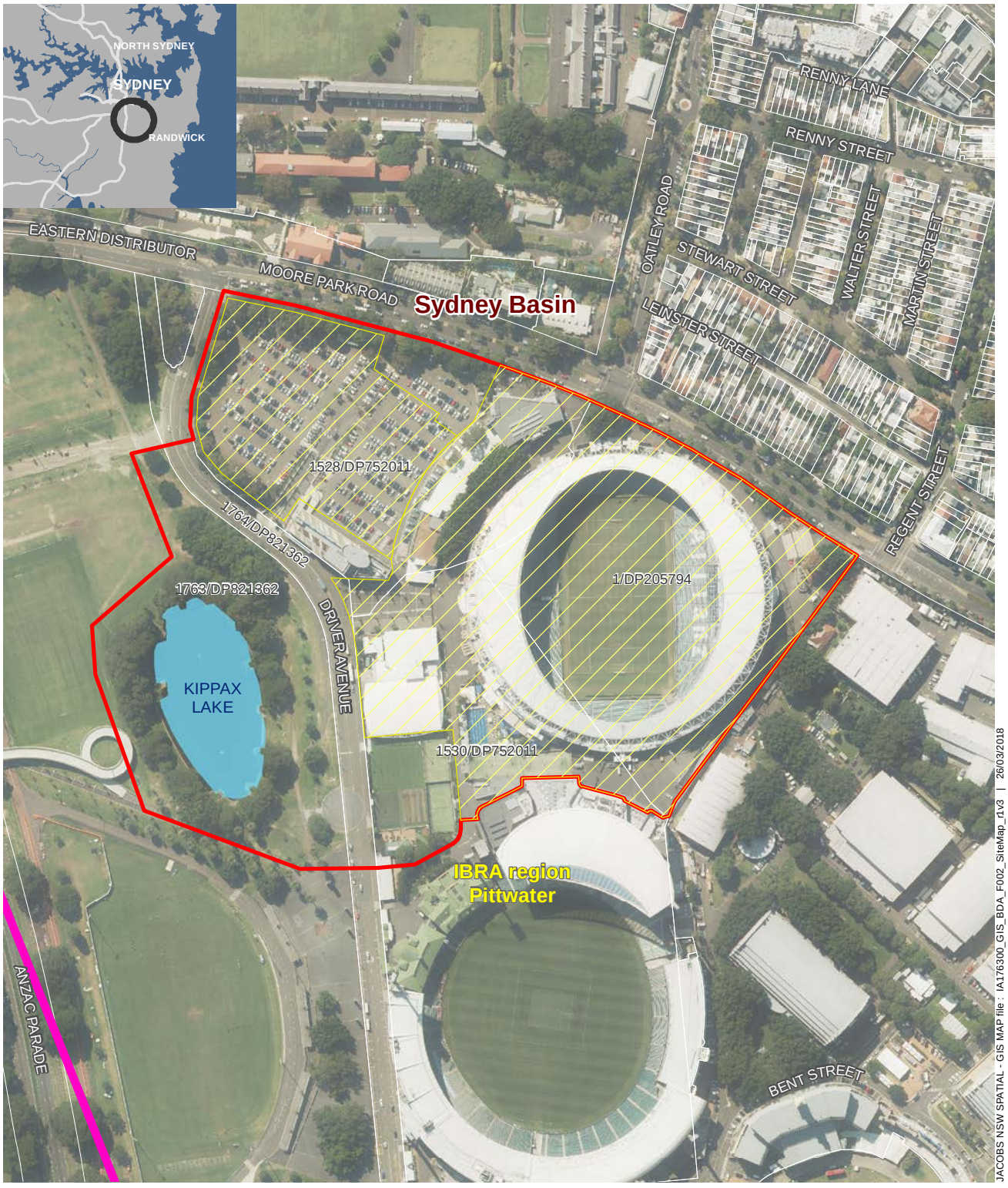
Figure 1.1 | Location map



Legend

- Study area
- Development site
- Habitat connectivity
- Water body

0 50 100m
1:4,000 @ A4

N

Figure 1.2 | Site map

2. Methodology

2.1 Personnel

This biodiversity assessment was undertaken and prepared by appropriately qualified and experienced ecologists (refer to Table 2.1).

Table 2.1 : Personnel, role and qualifications

Name	Role	Qualifications
Lukas Clews	Senior Ecologist - Technical lead, reporting	Master of Scientific Studies Graduate Certificate in Applied Science Bachelor of Science Diploma in Conservation and Land Management Accredited under Section 6.10 of the *Biodiversity Conservation Act 2016* as a Biodiversity Assessment Method Assessor (Accreditation No. BAAS17060)
Paul Rossington	Senior Ecologist – Field survey Technical review of first draft	Bachelor of Science (Biology)Master of Wildlife Management Biodiversity Assessment Method trained and awaiting processing of accreditation

2.2 Background research

A background review of existing information was undertaken to identify the existing environment of the proposal within a search area of 10 kilometres by 10 kilometres around the centre of the site. The review focussed on database searches, relevant reports pertaining to the study area, property boundaries, and relevant GIS layers. The review was used to prepare a list of threatened species, populations and communities as well as important habitat for migratory species with a likelihood of occurrence in the study area and locality. The searches were also undertaken to identify if an Areas of Outstanding Biodiversity Value are present.

The following database searches were performed:

- BioNet - the website for the Atlas of NSW Wildlife and OEH Threatened Species Profile Database.
- NSW Department of Primary Industries (DPI) freshwater threatened species distribution maps.
- The federal Department of Environment's Protected Matters Search Tool.
- OEH BioNet Vegetation Classification database.
- The federal Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE).
- Department of Environment's directory of important wetlands.
- Department of Planning and Environment's SEPP 14 wetlands spatial data.

Regional vegetation mapping projects including the *Southeast NSW Native Vegetation Classification and Mapping – SCIVI* (VIS_ID 2230), (State Government of NSW and Office of Environment and Heritage 2010), the *Native Vegetation of the Sydney Metropolitan Area - Version 3* (VIS_ID 4489) (State Government of NSW and Office of Environment and Heritage 2016).

Preliminary and provisional determinations to list species and ecological communities as threatened under the BC Act were viewed on the OEH NSW Threatened Species Scientific Committee website (Office of Environment and Heritage 2017). There were no preliminary or provisional listings of relevance to the proposal.

The annual Final Priority Assessment List of nominated species and ecological communities that have been approved for assessment by the Minister responsible for the EPBC Act was reviewed (period commencing 1

October 2017) (Department of the Environment and Energy 2017). None of the nominated species and ecological communities are of relevance to the proposal.

2.3 Field survey

A field survey was undertaken within the study area on the 1st of February 2018 to ground-truth the results of the background research and habitat assessment.

2.3.1 Vegetation surveys

Due to the characteristics of the development site, a vegetation survey was not able to be completed using the field survey methods in line with Chapter 5 of the Biodiversity Assessment Method (BAM) (Office of Environment and Heritage 2017). A plot-based vegetation survey of the study area was not undertaken as there are no Plant Community Types present in the development site and hence vegetation zones could not be established. A vegetation integrity assessment was not able to be undertaken.

The vegetation survey was limited to verification of the identification of trees in the development site as identified in the Arboricultural Report prepared for Moore Park by Tree IQ (Tree IQ 2016). The vegetation was mapped to identify vegetation extent.

2.3.2 Habitat assessment

A habitat assessment was undertaken within the study area on the identified list of threatened flora and fauna species known or predicted to occur in the Pittwater IBRA subregion that have been recorded within a 10 kilometre radius of the proposal (see Appendix A for the habitat assessment results). This list was identified from databases and literature as well as past surveys. The habitat assessment compared the preferred habitat features for these species with the type and quality of the habitats identified in the study area. This habitat assessment was completed to make an assessment of the likelihood of the species being present in the study area (i.e. subject species).

The criteria used in the habitat assessment are detailed in Table 2.2. The results of the habitat assessment are provided in Appendix A.

Table 2.2 : Likelihood of occurrence classification and criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 x 10 km area) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, 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.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km x 10km area). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

2.3.3 Threatened species surveys

The habitat assessment identified that there is limited habitat in the development site for threatened species. For this reason, targeted surveys were not undertaken for preparation of this BDAR. Where suitable habitat for a threatened species was found to be present, the species was assumed to be present.

2.4 Limitations

The vegetation field survey was able to provide adequate spatial coverage and survey effort for the entire study area. This was achievable in the timeframe given the small size of the study area. Detailed floristic survey of vegetation was not able to be undertaken as no native vegetation that could be assigned to a PCT was present on the development site. The field survey confirmed the identification of trees in the development site as identified in the Arboricultural Report prepared for Moore Park by Tree IQ (Tree IQ 2016). The conclusions of this report are based upon available data and limited field survey and are indicative of the environmental condition of the study area at the time of the survey. It should be recognised that site conditions, including the presence of threatened species, can change with time. To address this limitation, the assessment has aimed to identify the presence and suitability of the habitat for threatened species.

The mapping included in this report shows distribution of vegetation and habitat within the study area. In many cases, the boundaries between habitats are not well-defined and the mapping provides an approximation of on-ground conditions.

3. Landscape context

3.1 IBRA bioregions and IBRA subregions

The study area is located within the Pittwater sub-region of the Sydney Basin Bioregion as defined by Thackway and Cresswell (1995).

3.2 Mitchell landscapes

The development site is most likely within the Sydney – Newcastle Barriers and Beaches Mitchell Landscape as mapped by the NSW National Parks and Wildlife Service (2002) and described by the NSW Department of Environment and Climate Change (2008). The landscape is dominated by Quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands backed by sand dunes and intermittently closed and open lagoons. The landscape is of gently undulating to rolling coastal dunefields. The underlying geology is marine sand.

3.3 Rivers, streams and estuaries

There are no rivers, streams or estuaries within the development footprint. However, Rushcutters Creek is present at the outer northern edge of the 1500 metre landscape buffer which drains to the harbour at Rushcutters Bay. Lake Kippax is present to the west of Driver Avenue and there are several lakes present within the 1500 metre buffer in the Centennial Parklands including Busbys Pond, Randwick Pond, and Duck Pond.

3.4 Wetlands

There are no important wetlands (SEPP44 or Ramsar sites) present in the development footprint, 1500 metre buffer or downstream of the project.

3.5 Connectivity of different areas of habitat

In terms of habitat connectivity, the development site is located within a highly disturbed landscape where the majority of habitats have been cleared. The habitats that do remain are fragmented and highly isolated. However, planted urban vegetation does provide a role in facilitating the movement of threatened species across the landscape. There is no obvious physical habitat connectivity associated with the development site so a discreet corridor cannot be drawn on a map. However, flying animals such as birds and bats use the airspace to move between habitats and the planted vegetation is used as a foraging or perching resource as part of daily movements. For example, a portion of the Grey-headed Flying-fox population leaves the nationally important Centennial Park camp of an evening and passes over the development site in a northerly direction as the animals head to foraging grounds. The animals will then return over the development site to the Centennial park camp to roost in the morning.

3.6 Areas of geological significance and soil hazard features

There are no areas of geological significance (e.g. karst, caves, crevices, cliffs) associated with the development site or 1500 metre buffer. The soils are deep podzols which have limitations including extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high water tables (Chapman and Murphy 1989).

3.7 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value as declared by the Minister on the development site or in the 1500 metre buffer area.

3.8 Native vegetation cover

Under the BAM, native vegetation has the same meaning as in section 1.6 of the BC Act. Under section 1.6 of the BC Act, native vegetation has the same meaning as in Part 5A of the *Local Land Services Act 2013* (LLS Act). Part 5A section 60B of the LLS Act outlines the following meaning of "native vegetation":

For the purposes of this Part, native vegetation means any of the following types of plants native to New South Wales:

a) trees (including any sapling or shrub or any scrub),

b) understorey plants,

c) groundcover (being any type of herbaceous vegetation),

d) plants occurring in a wetland.

The development site does not possess any naturally occurring native vegetation, woody or non-woody, that can be assigned to a PCT (see Section 4). However, the development site does contain a number of planted trees that are native to New south Wales (for example *Corymbia maculata, Eucalyptus microcorys, Eucalyptus tereticornis, Eucalyptus saligna, Lophostemon confertus, Elaeocarpus reticulatus, Archontophoenix cunninghamiana, Livistona australis, Ficus macrophylla, Ficus rubiginosa, Cupaniopsis anacardioides*, etc.). Therefore, this vegetation is considered native vegetation for the purposes of the BAM.

The area of planted native vegetation was used in the native vegetation cover assessment of the development site. The *Native Vegetation of the Sydney Metropolitan Area - Version 3* (VIS_ID 4489) (State Government of NSW and Office of Environment and Heritage 2016) map was used to determine the native vegetation cover extent in the 1,500 metre buffer. The native vegetation cover assessment for the project is as follows:

- Native vegetation cover within the development site is approximately 4.5% and is assigned to the 0 – 10% class.
- Native vegetation cover within the 1,500 metre buffer area is approximately 12.7% and is assigned to the >10 – 30% class.

Native vegetation cover is shown on Figure 1.1.

3.9 Patch size

Under the BAM a patch size is assigned to each vegetation zone. A vegetation zone means an area of native vegetation on the subject land (development site) that is the same PCT and has a similar broad condition state.

The development site does not contain any naturally occurring native vegetation, woody or non-woody, that can be assigned to a PCT (see Section 4). As there are no PCTs on the development site there are no vegetation zones for which a patch size can be determined. For the purposes of the assessment, the smallest patch size area of <5 ha has been assigned.

4. Native vegetation and vegetation integrity

The development site and study area have been comprehensively modified from their original state. There is little natural terrestrial vegetation in the locality with only 12.7% cover in the 1,500 metre buffer. The closest patches of naturally occurring vegetation present are in the Centennial Parklands, Queens Park, York Road and Cooper Park to the east of the study area.

There is some native vegetation (according to the definition of native vegetation provided in the LLS Act – see Section 3.8) that has been planted in the development site (see Figure 4.1). However, this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the OEH BioNet Vegetation Classification. As such, the vegetation cannot be allocated to vegetation zones. The habitat types in the development site and study area are best described as miscellaneous ecosystems as identified by the OEH, specifically:

- Highly disturbed areas with no or limited native vegetation.
- Water bodies, rivers, lakes, streams (not wetlands).

The variety of vegetation and habitats present in the development site is illustrated in Photos 1 to 12.

As the native vegetation cannot be assigned to a PCT, it is not possible to assess vegetation integrity by undertaking an assessment of the composition, structure or function of the vegetation according to the field methods outlined in Section 5.3 of the BAM. A vegetation integrity score cannot be determined in accordance with Section 5.4 of the BAM as there are no PCTs that will be impacted.

No PCTs will be affected, so the project will not result in any alteration to vegetation integrity. There will be no loss of vegetation composition, structure or function (as assessed according to the BAM) as a result of the project.

4.1 Threatened ecological communities

There are no threatened ecological communities located in or directly adjacent to the development site.

The nearest threatened ecological community to the development site are the patches of Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion that are present in Centennial Park but this vegetation will not be affected by the project.

Photo 1 : *Lophostemon confertus* near Gate 2

Photo 2 : Exotic trees in the development site

Photo 3 : Gardens in the development site

Photo 4 : *Cupaniopsis anacardioides* at the stadium entry

Photo 5 : Large *Ficus* in the development site

Photo 6 : Planted *Lophostemon confertus* at the car park

Photo 7 : Planted *Corymbia maculata*

Photo 8 : Planted exotic trees in the development site

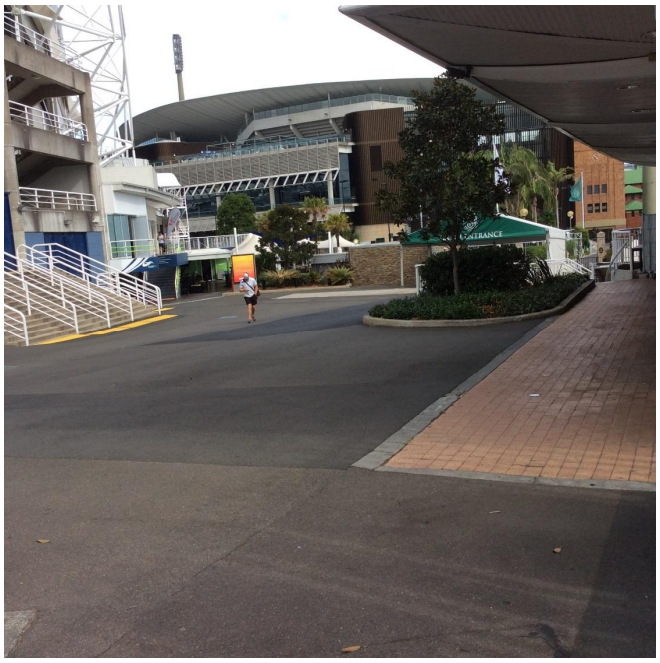
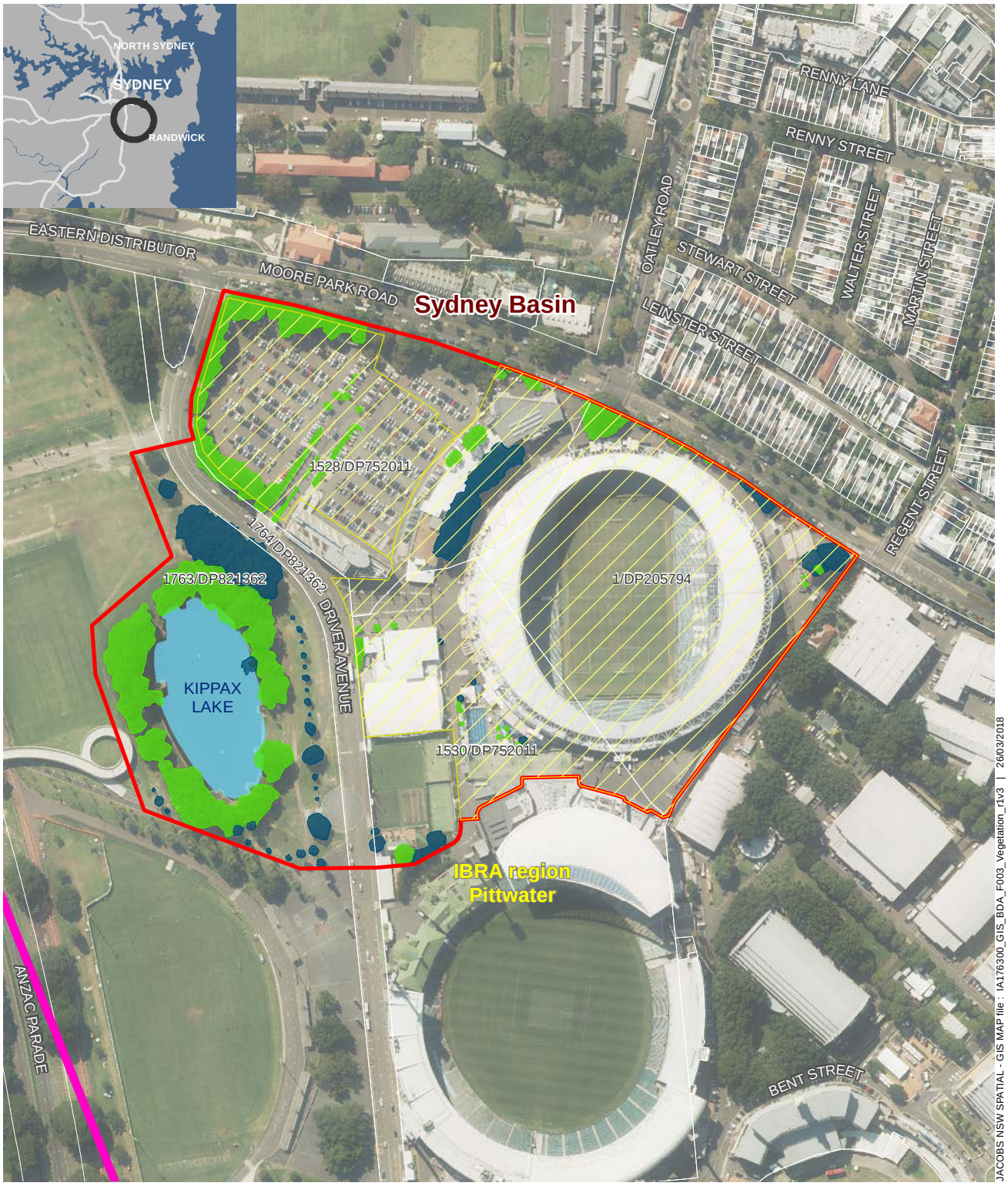


Photo 9 : Planted trees in the development site

Photo 10 : Mown lawns under *Ficus* trees near Kippax Lake

Photo 11 : Mown lawns in the development site

Photo 12 : *Ficus* spp. around Kippax Lake



Legend

- Study area
- Development site
- Habitat connectivity
- Native vegetation
- Non native vegetation
- Water body

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Figure 4.1 | Vegetation within the study area

5. Assessing habitat suitability for threatened species

5.1 Assessing habitat suitability for species that can be predicted by habitat surrogates (ecosystem credits)

Ecosystem credit species are those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. Ecosystem credit threatened species must be assessed in conjunction with information about site context of the development site (Section 4.3 and Subsection 5.3.2 of the BAM), PCTs and vegetation integrity attributes (Chapter 5 of the BAM), and data from the Threatened Biodiversity Data Collection (Section 6.1 of the BAM).

During the assessment of biodiversity values as required by Chapter 5 of the BAM the development site was found to contain some planted native vegetation. However, this native vegetation is not naturally occurring and cannot be assigned to a PCT. As a result, there are no ecosystem credit species that are predicted to occur on the development site since there is no suitable habitat that can be used as a habitat surrogate.

Ecosystem credit species are not considered any further in this report as there are no PCTs present on the development site and ecosystem credits cannot be created.

5.2 Assessing habitat suitability for species that cannot be predicted by habitat surrogates (species credit species)

Habitat suitability is identified as the degree to which the habitat needs of threatened species are present at a particular site. Species credit species have been assessed in conjunction with information collected about the site context of the subject land (Section 4.3 of the BAM), on PCTs and vegetation integrity attributes in (Section 5 of the BAM), and data obtained from the Threatened Biodiversity Data Collection (Section 6.1 of the BAM).

5.2.1 Step 1: Identifying threatened species for assessment

As discussed above in Section 4 and Section 5.1, the development site was found to contain some planted native vegetation. However, this native vegetation is not naturally occurring and cannot be assigned to a PCT. The habitat types in the development site and study area are best described as miscellaneous ecosystems as identified by the OEH, specifically:

- Highly disturbed areas with no or limited native vegetation.
- Water bodies, rivers, lakes, streams (not wetlands).

The Threatened Biodiversity Data Collection was examined to retrieve a list of species credit species that are known to use the miscellaneous ecosystems present within the study area and have been previously recorded in the locality (10km x 10 km are centred on the subject site). These species credit species were then identified for assessment in Step 2 if the criteria in Section 6.4.1.3 of the BAM were met.

The species credit species identified at Step 1 include:

- *Acacia pubescens*
- *Allocasuarina portuensis*
- *Eucalyptus camfieldii*
- *Hibbertia puberula*
- *Microtis angusii*
- Bush Stone-curlew
- Little Eagle

- Swift Parrot
- Green and Golden Bell Frog
- Eastern Bentwing-bat
- Southern Myotis.

5.2.2 Step 2: Assessment of the habitat constraints and vagrant species on the subject land

For this project, an additional assessment of the habitat constraints on the subject land for the threatened species predicted for assessment was undertaken. The habitat constraints identified in the Threatened Biodiversity Data Collection were used to assess the habitat on the subject land for each threatened species predicted for assessment. Some species do not have habitat constraints identified in the Threatened Biodiversity Data Collection so this step is not applicable and these species are automatically referred to as a 'candidate species credit species' that require further assessment under Step 3.

The species credit species with associated habitat constraints as identified in the Threatened Biodiversity Data Collection are:

- Bush Stone-curlew - Fallen/standing dead timber including logs.
- Little Eagle – Breeding, nest trees - live (occasionally dead) large old trees within vegetation.
- Swift Parrot – Breeding, as per mapped areas; breeding restricted to Tasmania.
- Green and Golden Bell Frog - Semi-permanent/ephemeral wet areas - Within 1km of wet areas, swamps - within 1km of swamps, waterbodies - Within 1km of waterbody.
- Eastern Bentwing-bat – Breeding, caves - Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding.
- Southern Myotis - Hollow bearing trees - Within 200 m of riparian zone, bridges, caves or artificial structures within 200 m of riparian zone.

Some species identified from the assessment, including the Little Eagle, Swift Parrot, Eastern Bentwing-bat, and Grey-headed Flying-fox, are dual ecosystem / species credit species. These species are generally regarded as ecosystem credit species unless a project will impact on a specific localised breeding habitat feature, or in the case of the Swift Parrot, mapped important areas. The development site does not contain nest trees - live (occasionally dead) large old trees within vegetation suitable as breeding habitat for the Little Eagle. The development site does not contain mapped important areas for the Swift Parrot. The development site does not contain a cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding by the Eastern Bentwing-bat. The development site does not contain a Grey-headed Flying-fox breeding camp so the breeding habitat constraint for this species is absent. As such, these dual credit species have been excluded from the assessment.

The Bush Stone Curlew has been excluded from the assessment of species credit species because the development site lacks the key habitat constraint for this species in the form of fallen/standing dead timber including logs. The development site is not within 200 m of a riparian zone so the habitat constraints for the Southern Myotis are not met and this species has been removed from the assessment.

The development site is located within 1 km of a waterbody, Kippax Lake. Therefore, the habitat constraints for the Green and Golden Bell Frog are met. The Green and Golden Bell Frog is referred to as a 'candidate species credit species' and requires further assessment under Step 3.

5.2.3 Step 3: Identify candidate species credit species for further assessment

There are five threatened plants that are species credit species requiring assessment in Step 3:

- *Acacia pubescens*
- *Allocasuarina portuensis*

- *Eucalyptus camfieldii*
- *Hibbertia puberula*
- *Microtis angusii*.

To determine whether these species can be considered unlikely to occur on the subject land, a field assessment was carried out to identify the broad habitats and microhabitats present. The development site is a highly disturbed area with no or limited native vegetation and these plants have been known to occur in such habitats. However, the particular circumstances of the habitat in the development site make it unsuitable for these threatened plants as the vegetation present has been planted, and the ground surface highly modified through installation of hard surfaces, soil, mulch, lawns and groundcover plants resulting in the absence of near-natural areas of soil and groundcover.

Acacia pubescens is generally a species from the Cumberland IBRA subregion with only a few records occurring on the periphery of the Pittwater subregion. The nearest record is at Bexley. The development site is outside of the known distribution of this species and it does not naturally occur in vegetation on the Quaternary coastal sediments of the study area. *Acacia pubescens* is considered unlikely to occur on the subject land and does not require further assessment.

The original known habitat of the *Allocasuarina portuensis* is at Nielsen Park in the Woollahra LGA. There are no plants left at the original site but this species has been planted successfully at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vaucluse House. This species does not occur in the development site. *Allocasuarina portuensis* is considered unlikely to occur on the subject land and does not require further assessment.

Eucalyptus camfieldii occurs in coastal heath from the Raymond Terrace area south to Waterfall. This is a species of exposed sandy ridges on Hawkesbury Sandstone geology and does not naturally occur on the Quaternary coastal sediments of the study area. The habitat in the development site has been extensively modified and the original vegetation has been cleared and replaced with an urban environment and planted specimen trees. *Eucalyptus camfieldii* is considered unlikely to occur on the subject land and does not require further assessment.

Hibbertia puberula favours forest and low heath habitats on sandy soils or rarely in clay. There is no suitable habitat for *Hibbertia puberula* on the development site. The original vegetation has been cleared and replaced with an urban environment and planted specimen trees. The ground layer is mown or mulched. *Hibbertia puberula* is considered unlikely to occur on the subject land and does not require further assessment.

Microtis angusii in the Pittwater IBRA subregion is known from the ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas. *Microtis angusii* has not been recorded outside of this area in Sydney (there are however recent NSW east coast records). The habitats in the development site are extensively modified and the original vegetation has been cleared and replaced with an urban environment and planted specimen trees. The ground layer is mown or mulched. *Microtis angusii* is considered unlikely to occur on the subject land and does not require further assessment.

To identify whether the Green and Golden Bell Frog could occur on the subject land, a field assessment was carried out to identify the broad habitats and microhabitats present. To determine areas of suitable habitat within the study area, a review of literature on the habitat requirements of the Green and Golden Bell Frog was conducted (Pyke and White 1996; Pyke 2002). These authors document the criteria found most consistently at sites that support breeding and non-breeding populations, this included the following:

- Presence of emergent vegetation providing shelter sites;
- Moderate to high level disturbance;
- Aquatic plant species present (especially *Typha* spp.);
- Still or low flowing water;
- Run-off urban / industrial / grazing or parkland;

- Substrate sand, or rock;
- Shallow water depth <50 cm;
- Nearby vegetation low, grassland, or shrubland or woodland;
- Unshaded or partial shade;
- Areas of grass nearby;
- No visible signs of pollution;
- *Crinia signifera* or *Limnodynastes peronii* present; and
- *Gambusia holbrooki* absent.

Kippax Lake contains many of the features listed above that make a waterbody suitable for the Green and Golden Bell Frog. However, the high numbers of *Gambusia holbrooki* present and lack of emergent aquatic vegetation, together with an absence of records from Kippax Lake, indicate that Kippax Lake does not currently provide habitat for the Green and Golden Bell Frog. The surrounding grassland is intensively managed by mowing so no shelter sites are present. If the Green and Golden Bell Frog was present in Kippax Lake, it is likely it would be well known and intensively managed. The assessment has determined that the habitat is substantially degraded such that the species is unlikely to utilise the subject land. The Green and Golden Bell Frog does not require further assessment.

The candidate species identified in this section do not have suitable habitat in the development site and do not require further assessment. Steps 4 to 6 or a threatened species survey are not required.

5.3 Identifying potential prescribed biodiversity impacts on threatened species

This section identifies the potential prescribed biodiversity impacts on threatened species associated with the project in accordance with Section 6.7 of the BAM. These are impacts that are in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat.

5.3.1 Human made structures

The development site contains human made structures including the existing Allianz Stadium. Sports stadiums can be used by insectivorous bats as roosting habitat. In Texas, several thousand Mexican free-tailed bats roosted at the football stadium Kyle Field. In Florida, several thousand insectivorous bats had inhabited the concrete bleachers of James G. Pressly Stadium and Scott Linder Tennis Stadium. However, these examples differ significantly from the behaviours insectivorous bats display locally. The candidate threatened species for the project that may utilise human made structures is limited to the Eastern Bentwing-bat.

The Eastern Bentwing-bat generally uses caves as the primary roosting habitat type, but may also use derelict mines, storm-water tunnels, buildings and other man-made structures. The breeding caves for this species are not located in the Sydney region and most bats of this species are present in the Sydney region outside of the breeding season during autumn and winter. This species is likely to forage on insects attracted to the lights of the SFS and surrounding buildings and car parks however is considered to have a low likelihood of using the SFS as a roosting site. This species is unlikely to roost in such an area subject to frequent human visitation or disturbance as it prefers more sheltered roost sites in urban areas such as tunnels, culverts or derelict buildings such as old military bunkers that are subject to little disturbance.

5.3.2 Non-native vegetation

The development site contains a mix of planted native and non-native vegetation. There is some native vegetation (according to the definition of native vegetation provided in the LLS Act – see Section 3.8) that has been planted in the development site (see Figure 4.1). However, this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the OEH BioNet Vegetation Classification. As such, the vegetation cannot be allocated to vegetation zones and cannot be assessed according to the methodology

outlined in Section 5 of the BAM. As such, the planted native vegetation is discussed here along with other non-native vegetation to identify potential prescribed biodiversity impacts on threatened species.

The development site possesses a number of planted trees that are native to New south Wales (for example *Corymbia maculata, Eucalyptus microcorys, Eucalyptus tereticornis, Eucalyptus saligna, Lophostemon confertus, Elaeocarpus reticulatus, Archontophoenix cunninghamiana, Livistona australis, Ficus macrophylla, Ficus rubiginosa, Cupaniopsis anacardioides*, etc.). These species, along with planted exotic trees such as *Ficus microcarpa* var. *hillii* and *Phoenix canariensis*, are known to provide a foraging resource for the threatened Grey-headed Flying-fox.

5.3.3 Habitat connectivity and threatened species movement

Habitat connectivity is identified as the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range. Threatened species movement is identified as the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle.

In terms of habitat connectivity, the development site is located within a highly disturbed landscape where the majority of habitats have been cleared. The habitats that do remain are fragmented and highly isolated. However, planted urban vegetation does play a role in facilitating the movement of threatened species across the landscape. There is no obvious physical habitat connectivity associated with the development site so a discreet movement corridor or corridors cannot be drawn on a map. However, functional connectivity exists for flying animals such as birds and bats that may use the airspace to move between habitats and the planted vegetation is likely to be used as a foraging or perching resource as part of daily movements. For example, a portion of the Grey-headed Flying-fox population leaves the nationally important Centennial Park camp of an evening and passes over the development site in a northerly direction as the animal's head to foraging grounds. The animals will then return over the development site to the Centennial Park camp to roost in the morning.

Threatened species in the locality including the Grey-headed Flying-fox and Eastern Bentwing-bat are powerful flyers capable of covering large distances between habitat patches. The landscape of the locality in its current form is permeable to these species and will not be affected by the project. No impacts to habitat connectivity are anticipated.

5.3.3.1 Flight path integrity

Associated with habitat connectivity and threatened species movement is flight path integrity. This is the degree to which the flight paths of protected animals over a particular site are free from interference. There will be an increase in building height from the proposal but it would not be sufficient to affect species movement or interfere with the current flight paths of any protected species. The movement of migratory, nomadic or local species is likely to continue unaltered as no obstacles will be placed in the flight path of any species. Importantly, no important habitats along the flight path of any species will be affected and the project does is unlikely to impose an increased collision risk to flying species.

The flight paths of the Grey-headed Flying-fox are unlikely to be affected by the project. In Sydney, the greatest numbers of Grey-headed Flying-foxes are found in summer and most bats disperse to the coast of northern New South Wales and Queensland areas in winter. The Sydney camps, including Centennial Park, are however continually occupied by some bats in all seasons. Most nightly foraging is within 20km of a camp and Grey-headed Flying-foxes can be seen flying over the development site as they disperse from the camp in Centennial Park. The Grey-headed Flying-fox is able to move freely over and between buildings and the project will not have an appreciable effect on the current flight paths of this species. Collision with the completed stadium during flight is considered unlikely.

5.3.4 Hydrological processes

There are no rivers, streams or estuaries within the development footprint. However, Rushcutters Creek is present at the outer northern edge of the 1,500 metre landscape buffer which drains to the harbour at Rushcutters Bay. Lake Kippax is present to the west of Driver Avenue and there are several lakes present

within the 1,500 metre buffer in the Centennial Parklands including Busbys Pond, Randwick Pond, and Duck Pond.

Any modification of land use through redevelopment may have adverse environmental impacts relating to the water cycle. For the project these impacts include:

- The concentrated point-source generation of wastewater that may lead to highly polluted and nutrient-laden volumes of water that are unsuitable for discharge to the environment without treatment.
- The coverage of the site with significant amounts of impervious surface results in:
  - Increases to the volume and intensity of stormwater runoff.
  - Increases to the pollutant and nutrient content of stormwater discharges due to the accumulation of litter and urban fallout on surfaces.

The development site and locality is already covered in impervious surfaces and little alteration to hydrological processes is anticipated. The water bodies in the locality such as Lake Kippax and the ponds in Centennial Park may provide a source of drinking water for the Grey-headed Flying-fox and Eastern Bentwing-bat but the project is not anticipated to affect these water bodies.

5.4 Matters of National Environmental Significance

5.4.1 Threatened ecological communities

There are no threatened ecological communities located in or directly adjacent to the development site. The nearest threatened ecological community to the development site constitutes the patches of Eastern Suburbs Banksia Scrub of the Sydney Basin Bioregion that are present in Centennial Park but this vegetation will not be affected by the project.

5.4.2 Threatened species

One threatened species listed under the EPBC Act is known to use the habitats in the study area for foraging: The Grey-headed Flying-fox (listed as vulnerable). No roost camps are present in the development site but the bats from the Centennial Park camp forage in the development site. Planted trees including *Corymbia maculata, Eucalyptus tereticornis, Eucalyptus saligna,* and *Lophostemon confertus* provide a floral foraging resource. Trees including *Archontophoenix cunninghamiana, Livistona australis, Ficus macrophylla, Ficus rubiginosa, Ficus microcarpa* var. *hillii* and *Phoenix canariensis* provide a fruiting resource. An assessment of significance completed in accordance with the *Matters of National Environmental Significance, Significant Impact Guidelines 1.1* (Department of the Environment 2013) is provided for the Grey-headed Flying-fox in Appendix B.

The Green and Golden Bell Frog and the Swift Parrot are considered unlikely to occur on the development site.

No threatened plant species listed under the EPBC Act are considered likely to occur in the development site. The habitats are highly disturbed and there are no natural habitats present.

5.4.3 Migratory species

Seventy-five listed migratory species were identified in the EPBC Act Protected Matters Search Tool as potentially occurring in the locality based on the distributional range of the species and modelled habitat. These migratory species, along with their preferred habitat requirements and an assessment of their likely presence in the study area are listed in Appendix A (some species such as whales, sharks, fish, etc. were omitted from the assessment). Only the Fork-tailed Swift and White-throated Needletail are considered moderately likely to fly over the development site but would not use it as habitat. While some migratory species of bird are likely to use the study area and locality, the development site would not be classed as an ‘important habitat’. A nationally significant proportion of the population would not be supported by the development site, as the habitats are not large enough or high enough quality. The project would not substantially modify, destroy or isolate an area of important habitat for the migratory species and it would not seriously disrupt the lifecycle of an ecologically significant proportion of a population of migratory birds.

6. Impact avoidance and minimisation

This section of the BDAR demonstrates the efforts taken to avoid and minimise impacts on biodiversity values in accordance with Section 8 of the BAM.

Combined with appropriate mitigation measures and safeguards during construction and operation of the project (which will be outlined in the project's Construction Environmental Management Plan (CEMP)), the siting and planning of the project is expected to be sufficient to ensure that the requirements to avoid and minimise impacts on biodiversity values as set out in Section 8 of the BAM are met. The site selection and planning process is detailed further below.

A key part of Infrastructure NSW's management of biodiversity for this proposal is the application of the 'avoid, minimise, mitigate and offset' hierarchy as follows:

1) Avoid and minimise impacts as the highest priority
2) Mitigate impacts where avoidance is not feasible or practicable in the particular circumstance
3) Offset where residual, significant unavoidable impacts would occur (if required).

6.1 Avoiding and minimising impacts on native vegetation and habitat

Infrastructure NSW proposes to develop the project on the site of the existing Allianz Stadium. Importantly, the project will not impact on:

- Endangered Ecological Communities (EECs) or Critically Endangered Ecological Communities (CEECs);
- PCTs that contain threatened species habitat;
- An area of land that the Minister for Environment has declared as an area of outstanding biodiversity value in accordance with Section 3.1 of the BC Act;
- The riparian areas of 4th order or higher streams and rivers, important wetlands or estuaries; or
- State significant biodiversity links.

While there is limited scope to choose the location of the project, direct impacts on clearing of native vegetation and habitat have been avoided as the project is located in an area where there are limited biodiversity values.

6.2 Avoiding and minimising prescribed biodiversity impacts

Some types of projects may have impacts on biodiversity values in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat. For many of these impacts, the biodiversity values may be difficult to quantify, replace or offset, making avoiding and minimising impacts critical.

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme:

a) impacts of development on the habitat of threatened species or ecological communities associated with:
   i. karst, caves, crevices, cliffs and other geological features of significance, or
   ii. rocks, or
   iii. human made structures, or
   iv. non-native vegetation
b) impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
c) impacts of development on movement of threatened species that maintains their life cycle

d) impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)

e) impacts of wind turbine strikes on protected animals.

f) impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

There is limited scope to choose the location of the project as it involves redevelopment of the existing stadium. There are no impacts to:

- karst, caves, crevices, cliffs and other geological features of significance
- rocks that provide habitat for threatened species
- water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.

The project is not a wind farm development so turbine strike is not an issue. The project does not involve construction or upgrade of a roadway so vehicle strike is not an impact requiring consideration.

There will be some unavoidable impacts to human made structures but these are unlikely to be used by threatened species. There will also be an impact on and non-native vegetation that provides habitat, albeit marginal, for threatened species.

7. Assessment of impacts

7.1 Impacts on native vegetation and habitat

There is some native vegetation (according to the definition of native vegetation provided in the LLS Act – see Section 3.8) that has been planted in the development site (see Figure 4.1). However, this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the OEH BioNet Vegetation Classification. As such, the impacts to this native vegetation cannot be determined in accordance with Subsections 9.1.2, 9.1.3 and 9.1.4 of the BAM.

There will be no indirect impacts on native vegetation or habitat resulting from the project. The construction and operation of the project is restricted to a discreet area and there are no adjoining areas of native vegetation beyond the development site that would be impacted.

7.2 Prescribed biodiversity impacts

7.2.1 Impacts to habitat of threatened species or ecological communities associated with human made structures

The assessment of the impacts of development on the habitat of threatened species or ecological communities associated with human made structures must:

a) identify the human made structures with potential to be habitat for threatened species or ecological communities

b) identify the species and ecological communities likely to use the habitat

c) describe the nature, extent and duration of short and long-term impacts

d) describe, with reference to relevant literature and other reliable published sources of information, the importance within the bioregion of the habitat to these species or ecological communities

e) predict the consequences of the impacts for the local and bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information.

As outlined in Section 5.3.1, The development site contains human made structures including the existing Allianz Stadium. The candidate threatened species for the project that may utilise human made structures is the Eastern Bentwing-bat. This species is likely to forage on insects attracted to the lights of the SFS and surrounding buildings and car parks however is considered to have a low likelihood of using the SFS as a roosting site. In a bioregional context, the SFS is not an important habitat for the Eastern Bentwing-bat. Human made structures are not a limiting habitat feature for this species in the bioregion and the SFS is not known to host a colony of this species. There will not be any impact to a known roost. The predicted consequences of the proposal on the local and bioregional persistence of the Eastern Bentwing-bat are negligible.

7.2.2 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

The assessment of the impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation must:

a) identify the species and ecological communities likely to use the habitat

b) describe the nature, extent and duration of short and long-term impacts

c) describe, with reference to relevant literature and other reliable published sources of information, the importance within the bioregion of the habitat to these species or ecological communities

d) predict the consequences of the impacts for the local and bioregional persistence of the suite of threatened species and communities likely to use these areas as habitat, with reference to relevant literature and other published sources of information.

The impacts to planted native vegetation are discussed here along with other non-native vegetation to identify potential prescribed biodiversity impacts on threatened species. The development site contains a number of planted trees that are native to New south Wales along with planted exotic trees. The majority of the trees in the development site are known to provide a flowering or fruiting resource on which the threatened Grey-headed Flying-fox forages.

The extent of native vegetation and planted and urban native / exotic vegetation in the 1,500 metre buffer area is approximately 115 hectares. A large proportion of this vegetation is composed of street tree and landscape plantings that provide a foraging resource for the Grey-headed Flying-fox such as *Corymbia maculata, Corymbia citriodora, Lophostemon confertus, Archontophoenix cunninghamiana, Livistona australis, Ficus* spp. and *Phoenix canariensis*. The impacts to habitat for the Grey-headed Flying-fox that may result from the project (a worst case scenario) would involve removal of approximately 0.62 hectares (6,185 m^2) but not all vegetation in the development site will be removed, nor is all of the vegetation likely to be used for foraging. The proportional impact would be minor at 0.5% of the available foraging resource. The impact would be long term as any trees planted to replace those lost would take time to grow to maturity unless advanced trees are used in landscaping.

The urban vegetation in the Sydney region is important for the Grey-headed Flying-fox as at least a portion of the population remain in the Centennial Park camp year round. With the extensive clearing of natural habitats that has occurred, the urban vegetation now provides an important foraging resource for this species. However, the vegetation to be removed is not identified as an important resource in the bioregion. Productive native forests and roost camps are the most important habitats in the bioregion and these will not be affected by the project.

The project is not predicted to have any substantial long term consequences for the local or bioregional persistence of the Grey-headed Flying-fox. The persistence of this species does not depend on the habitats that may be affected by the project. The predicted impacts to the habitat are minimal.

7.2.3 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The assessment of the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range must:

a) identify the area/s of connectivity joining different areas of habitat that intersect with the subject land and the areas of habitat that are connected according to Paragraph 4.2.1.3 of the BAM

b) identify the species and ecological communities likely to benefit from the connectivity

c) describe the nature, extent and duration of short and long-term impacts

d) describe, with reference to relevant literature and other reliable published sources of information, the importance of the area of connectivity within the bioregion

e) predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities currently benefitting from the connectivity with reference to relevant literature and other published sources of information and taking into consideration mobility, abundance, range and other relevant life history factors.

The development site is located within a highly disturbed landscape where the majority of habitats have been cleared. The habitats that do remain are fragmented and highly isolated. However, planted urban vegetation does provide a role in facilitating the movement of threatened species across the landscape. There is no obvious physical habitat connectivity associated with the development site.

However, functional connectivity exists for flying animals such as birds and bats that use the airspace above the development site to move between habitats and the planted vegetation is used as a foraging or perching

resource as part of daily movements. In terms of threatened species, a portion of the Grey-headed Flying-fox population leaves the nationally important Centennial Park camp of an evening and passes over the development site in a northerly direction as the animals head to foraging grounds. The animals will then return over the development site to the Centennial park camp to roost in the morning. The Eastern Bentwing-bat is also likely to move through the development site on occasion.

The project is considered unlikely to have a detrimental effect on habitat connectivity. The threatened species that may use the development site are capable flyers able to cover large distances between habitat patches. The habitats in the development site are not important or unique in the landscape and the project will have a limited effect on the current dispersal and movement of species throughout the locality. No barriers to movement will be introduced and no further fragmentation of habitats will occur. Mitigation is not required as there will be negligible impact to the bioregional persistence of threatened species that currently benefit from the limited connectivity in the locality.

7.2.4 impacts of the development on movement of threatened species that maintains their life cycle

The assessment of the impacts of the development on movement of threatened species that maintains their life cycle must:

a) identify movement patterns key to the life cycle of relevant threatened species that intersect with the subject land

b) describe the nature, extent and duration of short and long-term impacts

c) describe, with reference to relevant literature and other reliable published sources of information, the importance of the movement of the threatened species to their life cycle

d) predict the consequences of the impacts for the bioregional persistence of the threatened species, with reference to relevant literature and other published sources of information.

Threatened species in the locality including the Grey-headed Flying-fox and Eastern Bentwing-bat are powerful flyers capable of covering large distances between habitat patches. The landscape of the locality in its current form is permeable to these species and will not be affected by the project. The movement patterns of these species are not rigid.

A portion of the Grey-headed Flying-fox population leaves the nationally important Centennial Park camp of an evening and passes over the development site in a northerly direction as the animal's head to foraging grounds. The animals will then return over the development site to the Centennial park camp to roost in the morning. The Eastern Bentwing-bat is also likely to move through the development site on occasion but there is no known pattern to the movement.

No barriers to movement will be introduced and no further fragmentation of habitats will occur. The development site is not part of a recognised movement corridor between breeding grounds, foraging grounds, or other habitats important for the lifecycle of species such as staging points for migration. Mitigation is not required as there will be negligible impact to the bioregional persistence of threatened species that currently benefit from the limited connectivity in the locality.

8. Mitigating and managing impacts on biodiversity values

Once all practicable steps to avoid or minimise impacts have been implemented at the design phase, mitigation measures will be implemented to further lessen the potential ecological impacts of the proposal. Mitigation measures are to be undertaken during the construction and operational phases. The proposed techniques, timing, frequency and responsibility for implementing each measure are outlined in Table 8.1.

There is some native vegetation (according to the definition of native vegetation provided in the LLS Act – see Section 3.8) that has been planted in the development site (see Figure 4.1). However, this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the OEH BioNet Vegetation Classification. As such, the impacts to this native vegetation cannot be determined in accordance with Subsections 9.1.2, 9.1.3 and 9.1.4 of the BAM. As such, mitigation measures are not provided for native vegetation. Mitigation for impacts to habitat not associated with native vegetation is the focus.

The project will not result in:

- removal of breeding habitat or other habitat features during construction
- disruption to established home ranges
- disruption to connections between suitable habitat for foraging and dispersal.

The main impacts associated with the proposal are those resulting from the removal of non-native and planted (non-indigenous) native vegetation. The potential for fauna injury or death during construction is considered low due to the absence of natural habitats and absence of large populations of species. However, mitigation measures are still required.

Table 8.1 : Proposed mitigation measures

Mitigation measure	Timing and duration	Responsibility
Retain large fig at northern edge of site opposite Oatley Road.	Detailed design phase (Stage 2 DA)	Infrastructure NSW and construction contractor
Any trees to be protected during construction will be marked on ground and on maps.	Before construction.	Infrastructure NSW and construction contractor
Temporary fencing will be erected to protect trees that are to be retained.	Before construction.	Infrastructure NSW and construction contractor
A method of clearing that avoids damage to retained vegetation will be used. For example, removal of vegetation in small portions with the aid of an elevated work platform is preferable to felling entire trees.	During construction.	Infrastructure NSW and construction contractor
Re-establishment of vegetation suitable for foraging by the Grey-headed Flying-fox will be considered where practicable in areas disturbed by construction.	Stage 2 DA	Infrastructure NSW and construction contractor
The installation of an artificial microbat roost structure will be considered in landscape design.	Stage 2 DA	Infrastructure NSW and construction contractor
Allow any fauna to leave an area without intervention as much as possible.	During construction.	Infrastructure NSW and construction contractor
Sediment barriers to control the quality of water released from the site	Before construction.	Infrastructure NSW and construction contractor.
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Before and during construction.	Infrastructure NSW and construction contractor.

9. Thresholds for the assessment and offsetting of impacts of development

The assessment of site context, native vegetation, threatened ecological communities and the assessment of habitat suitability for threatened species under Stage 1 of the BAM, and the location of the project in an existing disturbed landscape suggest that the site is appropriate for the development.

This section of the BDAR identifies the impact thresholds that the assessor must apply including:

a) impacts on a potential entity that are serious and irreversible impacts

b) impacts for which the assessor is required to determine an offset requirement

c) impacts that do not require further assessment by the assessor.

9.1 Impacts on a potential entity that are serious and irreversible impacts

There are no impacts on a potential entity that are serious and irreversible impacts. There will be no impacts to a potential SAII entity that is listed in the *Guidance to assist a decision-maker to determine a serious and irreversible impact* that would be impacted on by the proposed development.

The project will not have any serious and irreversible impacts.

9.2 Impacts for which the assessor is required to determine an offset requirement

9.2.1 Impacts on native vegetation (ecosystem credits)

There is some native vegetation (according to the definition of native vegetation provided in the LLS Act – see Section 3.8) that has been planted in the development site (see Figure 4.1). However, this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the OEH BioNet Vegetation Classification or a vegetation zone. As such, the impacts to this native vegetation cannot be determined in accordance with Subsections 9.1.2, 9.1.3 and 9.1.4 of the BAM.

An offset requirement cannot be calculated in accordance with Chapter 11 of the BAM as no PCTs are present on the development site. No ecosystem credits are required.

9.2.2 Impacts on threatened species

The assessor is required to determine an offset for the impacts of development on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score ≥17. There are no PCTs or vegetation zones within the development site.

An offset requirement for species credit species cannot be calculated in accordance with Chapter 11 of the BAM. No species credits are required.

9.3 impacts that do not require further assessment by the assessor

An assessor is not required to assess areas of land on the development site for ecosystem credits without native vegetation under Chapter 4 or Chapter 5 of the BAM. Areas of land that do not contain native vegetation must still be assessed for threatened species, in accordance with Chapter 6 of the BAM and this has been undertaken (see Section 5 of this BDAR) and prescribed impacts have been assessed (see Section 7.2 of this BDAR).

10. Conclusions

The BOS applies to SSD projects unless the Secretary of the Department of Planning and Environment and the Chief Executive of OEH determine that the project is not likely to have a significant impact. This document is the BDAR for the project as required under the Biodiversity Assessment Method (BAM). This BDAR documents the results of the biodiversity assessment undertaken for the project in line with the relevant State and Commonwealth environmental and threatened species legislation and policy.

The development site and study area have been comprehensively modified from its original state. There is some native vegetation (according to the definition of native vegetation provided in the LLS Act – see Section 3.8) that has been planted in the development site (see Figure 4.1). However, this native vegetation is not naturally occurring and cannot be assigned to a PCT as identified in the OEH BioNet Vegetation Classification. As a result, the vegetation cannot be allocated to vegetation zones. As the native vegetation cannot be assigned to a PCT, it was not possible to assess vegetation integrity by undertaking an assessment of the composition, structure or function of the vegetation according to the field methods outlined in Section 5.3 of the BAM. A vegetation integrity score could not be determined in accordance with Section 5.4 of the BAM as there are no PCTs that will be impacted. There are no threatened ecological communities located in or directly adjacent to the development site.

As the native vegetation in the development site is not naturally occurring and cannot be assigned to a PCT, there is no PCT that can be used as a habitat surrogate and it is not possible for development of the site to generate an ecosystem credit requirement. Species credit species have been assessed in conjunction with information collected about the site context of the subject land (Section 4.3 of the BAM), on PCTs and vegetation integrity attributes in (Section 5 of the BAM), and data obtained from the Threatened Biodiversity Data Collection (Section 6.1 of the BAM). The candidate species identified during this assessment do not have suitable habitat in the development site and do not require further assessment.

These impacts are referred to in the BAM as prescribed impacts and relate to impacts on human made structures, non-native (non-PCT) vegetation, habitat connectivity and species movement. The assessment has concluded that the effects of the prescribed impacts are minor.

There is unlikely to be any significant impacts to any threatened or migratory species listed as a Matter of National Environmental Significance.

While there are no impacts that would generate a biodiversity credit requirement, there will be some impacts that nonetheless required assessment and mitigation. These impacts are referred to in the BAM as prescribed impacts. The prescribed impacts of relevance to the project include:

- Impacts to habitat of threatened species or ecological communities associated with human made structures.
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.
- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.
- Impacts of the development on movement of threatened species that maintains their life cycle.

The effects of the prescribed impacts are considered to be minor in the context of the project.

When the thresholds for the assessment and offsetting of impacts of development are considered, an offset requirement cannot be calculated in accordance with Chapter 11 of the BAM as no PCTs are present on the development site. No ecosystem credits are required. An offset requirement for species credit species cannot be calculated in accordance with Chapter 11 of the BAM. No species credits are required.

There are no impacts on a potential entity that are serious and irreversible impacts. Overall, the biodiversity impacts of the project are considered to be minor but some mitigation of prescribed impacts would be required.

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Appendix A. Likelihood of occurrence assessment

State and nationally listed threatened species identified from the literature review and database search were considered in terms of their likelihood to occur in the habitats present within the study area based on identified habitat requirements. The likelihood of occurrence was classified according to the criteria described in Table A.1. With high levels of urbanisation in the locality, the likelihood of threatened terrestrial species or communities occurring in the project area in its current condition is low (see Table A.2).

Table A.1 : Criteria for determining likelihood of occurrence

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10 x 10 km area) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, 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.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km x 10km area). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

Table A.2 : Likelihood of occurrence assessment for threatened terrestrial flora species

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Acacia bynoeana	Bynoe's Wattles	V	E	Found in central eastern NSW, from the Hunter District south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. 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. Associated overstorey species include Red Bloodwood (*Corymbia gummifera*), Scribbly Gum (*Eucalyptus haemastoma*), Drooping Red Gum (*E. parramattensis*), Old Man Banksia (*Banksia serrata*) and Small-leaved Apple (*Angophora bakeri*).	Unlikely
Acacia gordonii	-	E	E	Restricted to the north-west of Sydney, it has a disjunct distribution occurring in the lower Blue Mountains in the west, and in the Maroota/Glenorie area in the east. Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops.	Unlikely
Acacia pubescens	Downy Wattle	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravely soils, often with ironstone.	Unlikely
Acacia terminalis subsp. *terminalis*	Sunshine Wattle	E	E	Very limited distribution between Botany Bay to the northern foreshore of Port Jackson. Recent collections have only been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsely Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays. Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated	Unlikely
Allocasuarina glareicola	-	E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis*, *Eucalyptus fibrosa*, *Angophora bakeri*, *Eucalyptus sclerophylla* and *Melaleuca decora*. Common associated understorey species include *Melaleuca nodosa*, *Hakea dactyloides*, *Hakea sericea*, *Dillwynia tenuifolia*, *Micromyrtus minutiflora*, *Acacia elongata*, *Acacia brownei*, *Themeda australis* and *Xanthorrhoea minor*.	Unlikely
Allocasuarina portuensis	Nielsen Park She-oak	E	E	The original known habitat of the Nielsen Park She-oak is at Nielsen Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vaucluse House.	Unlikely
Amperea xiphoclada var. *pedicellata*	-	Ex	Ex	*Amperea xiphoclada* var. *pedicellata* is known only from the type specimen collected in 1892 from Sydney, NSW. The species has not been observed since and is presumed to be extinct.	Unlikely
Asterolasia buxifolia	-	-	E	Known from a single site at a granite outcrop in the riparian zone of the Lett River. Rediscovered in 2000, little is known about the species.	Unlikely
Asterolasia elegans	-	E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs. Also likely to occur in the western part of Gosford LGA. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone. Found 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 (*Syncarpia glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*Angophora costata*), Sydney Peppermint (*Eucalyptus piperita*), Forest Oak (*Allocasuarina torulosa*) and Christmas Bush (*Ceratopetalum gummiferum*).	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Caladenia tessellata	Thick-lipped Spider-orchid	V	E	Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Unlikely
Callistemon linearifolius	Netted Bottlebrush	-	V	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Was more widespread across its distribution in the past. Some populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island Nature Reserve. Further north it has been recorded from Yengo National Park and Werakata National Park. Grows in dry sclerophyll forest on the coast and adjacent ranges.	Unlikely
Chamaesyce psammogeton	Sand Spurge	-	E	Sand Spurge is found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to Queensland (and Lord Howe Island). Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park, Moonee Beach Nature Reserve and Bundjalung National Park. Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*).	Unlikely
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	Unlikely
Cynanchum elegans	White-flowered Wax Plant	E	E	Rare, recorded from rainforest gullies scrub and scree slopes; from the Gloucester district to the Wollongong area and inland to Mt Dangar.	Unlikely
Darwinia biflora	-	V	V	Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai LGAs (LGAs). Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include *Eucalyptus haemastoma*, *Corymbia gummifera* and/or *E. squamosa*. The vegetation structure is usually woodland, open forest or scrub-heath.	Unlikely
Deyeuxia appressa	-	E	E	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. 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.	Unlikely
Dichanthium setosum	Bluegrass	V	V	Dichanthium setosum has been reported from mid-coastal to inland NSW and Queensland. Dichanthium setosum occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending west to Narrabri. Dichanthium setosum is associated with heavy basaltic black soils and red-brown loams with clay subsoil.	Unlikely
Dillwynia tenuifolia	-	-	V	Core distribution is the Cumberland Plain from Windsor to Penrith east to Deans Park. Other populations in Western Sydney are recorded at Voyger Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. Disjunct localities include the Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains. In western Sydney, it may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. At Yengo, is reported to occur in disturbed escarpment woodland on Narrabeen sandstone.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Diuris arenaria	Sand Doubletail	-	E	Sand Doubletail is known from the Tomaree Peninsula near Newcastle. Large population known from Heatherbrae. This species occurs in coastal heath and dry grassy eucalypt forest on sandy flats.	Unlikely
Doryanthes palmeri	Giant Spear Lily	-	V	Giant Spear Lily occurs in far north-east NSW and south-east Queensland. In NSW, it occurs on the coastal ranges that are part of the Mt Warning Caldera. Its southern distributional limit is Mount Billen. The species is currently known from eleven sites within NSW, five of which are conservation reserves. Most populations consist of only a few hundred individuals.	Unlikely
Epacris purpurascens var. *purpurascens*	-	-	V	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	Unlikely
Eucalyptus camfieldii	Camfield's Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. 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 stunted species of E. oblonga Narrow-leaved Stringybark, E. capitellata Brown Stringybark and E. haemastoma Scribbly Gum.	Unlikely
Eucalyptus fracta	Broken Back Ironbark	-	V	Confined largely to State Forest. Locally common but restricted to the northern Broken Back Range near Cessnock, NSW. The dominant tree in a narrow band along the upper edge of a sandstone escarpment. Occurs in dry eucalypt woodland in shallow soils.	Unlikely
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally conservation reserves. Planted as urban trees, windbreaks and corridors. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	Unlikely
Eucalyptus pulverulenta	Silver-leafed Gum	V	V	The Silver-leafed Gum is found in two quite separate areas, the Lithgow to Bathurst area and the Monaro (Bredbo to Bombala). Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (*Eucalyptus mannifera*), Red Stringybark (*E. macrorhynca*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*).	Unlikely
Eucalyptus scoparia	Wallangarra White Gum	V	E	In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. In Queensland it is equally rare, occurring at three sites of which only one has more than a dozen trees. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. In Queensland it is equally rare, occurring at three sites of which only one has more than a dozen trees. It was commonly planted as an ornamental street tree in the suburbs of Sydney region prior to the 1980s.	Unlikely
Genoplesium baueri	Bauer's Midge Orchid	E	E	Recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the several conservation reserves including Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Found in sparse sclerophyll forest and moss gardens over sandstone	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Grammitis stenophylla	Narrow-leaf Finger Fern	-	E	Occurs in eastern Queensland and eastern NSW. In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri. Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	Unlikely
Grevillea caleyi	Caley's Grevillea	E	CE	Restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. Occurs in three major areas of suitable habitat, namely Belrose, Ingleside and Terrey Hills/Duffys Forest within the Ku-ring-gai, Pittwater and Warringah Local Government Areas. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *Corymbia gummifera*. Commonly found in the endangered Duffys Forest ecological community.	Unlikely
Haloragodendron lucasii	-	E	E	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney. Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels. Highly clonal, which implies the true population size may be considerably smaller than expected. Flowering occurs from August to November with fruits appearing from October to December. Has demonstrated an ability to resprout from its rootstock.	Unlikely
Hibbertia puberula	-	-	E	Recent work on this species and its relatives has shown it to be widespread, but never common. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath.	Unlikely
Hibbertia spanantha	Julian's Hibbertia	CE	CE	Endemic to NSW where it is restricted to a single population located in the northern Sydney suburb of Turramurra. Grows in forest with canopy species including Eucalyptus pilularis, E. resinifera, Corymbia gummifera and Angophora costata. The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae.	Unlikely
Hypsela sessiliflora (syn. *Isotoma sessiliflora)*	-	X	E	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 ecotone. Now regarded as a synonym of *Isotoma sessiliflora*.	Unlikely
Lasiopetalum joyceae	-	V	V	Has a restricted range occurring on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River. It is currently known from 34 sites between Berrilee and Duffys Forest. Seventeen of these are reserved. Grows in heath on sandstone.	Unlikely
Leptospermum deanei	-	V	V	Known from the Hornsby, Warringah, Ku-ring-gai and Ryde LGAs. Occurs in woodland on lower hill slopes or near creeks, sandy alluvial soil or sand over sandstone, riparian scrub woodland and open forest.	Unlikely
Melaleuca biconvexa	Biconvex Paperbark	V	V	Found only in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Unlikely
Melaleuca deanei	Deane's Paperbark	V	V	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai, Berowra, Holsworthy and Wedderburn areas, and there are also more isolated occurrences at Springwood, Wollemi National Park, Yalwal and the Central Coast areas. The species grows in heath on sandstone	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Microtis angusii	Angus's Onion Orchid	E	E	Currently known from only one site at Ingleside, north of Sydney. A collection previously thought to be this species was made from Sunny Corner 100 km west of Sydney, but has since been confirmed as being genetically distinct and may possibly be a subspecies. The Ingleside population occurs on soils that have been modified but were originally those of the restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas. These soils support a specific and distinct vegetation type, the Duffys Forest Vegetation Community which is listed as an endangered ecological community under the TSC Act and ranges from open forest to low open forest and rarely woodland. Exists as subterranean tubers during most of the year. Produces leaves and then flowering stems in late winter and spring and flowers from May to October. By summer, the above ground parts have withered leaving no parts above ground.	Unlikely
Pelargonium sp. Striatellum *G.W. Carr 10345*	Omeo Storksbill	E	E	Known from only 3 locations in NSW, with two on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. A population at a fourth known site on the Monaro has not been seen in recent years. 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 LGAs 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 LGAs. 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 sometimes colonises exposed lake beds during dry periods.	Unlikely
Persoonia hirsuta	Hairy Geebung	E	E	The Hairy Geebung has been recorded in the Sydney coastal area, the Blue Mountains area and the Southern Highlands. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely
Persoonia nutans	Nodding Geebung	E	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Core distribution occurs within the Penrith, and to a lesser extent, Hawkesbury LGAs, with isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown LGAs. Confined to Aeolian and alluvial sediments and occurs in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland.	Unlikely
Pimelea curviflora var. *curviflora*	Slender Curved Rice Flowers	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Unlikely
Pimelea spicata	Spiked-rice Flower	E	E	Broad distribution in western Sydney, occurring on the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas). Another smaller population is recorded in districts (Landsdowne to Shellharbour to northern Kiama) Illawarra. It grows on well-structured clay soils. On the inland Cumberland Plain sites, it is associated with Grey Box and Ironbark. In the coastal Illawarra it occurs commonly in Coastal Banksia open woodland with a more well developed shrub and grass understorey.	Unlikely
Prasophyllum fuscum	Slaty Leek Orchid	V	CE	Confined to the Blue Mountains area. Grows in moist heath, often along seepage lines. The known population grows in moist sandy soil over sandstone amongst sedges and grasses in an area that appears to be regularly slashed by the local council. Flowering does not necessarily occur every year, often skipping years. Although successful flowering and reproduction is likely to be dependent on favourable weather and habitat conditions, the factors which influence flowering behaviour are poorly understood. The seed is dust-like and is wind dispersed.	Unlikely
Prostanthera junonis	Somersby	E	E	The Somersby Mintbush is currently known only from the eastern parts of the Somersby Plateau in the Gosford local government area in NSW. The Somersby	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
	Mintbush			Mintbush frequently occurs along drainage lines or in seepage areas, usually in shallow, coarse, gravelly, white-grey, sandy soils overlying Hawkesbury Sandstone. This substrate supports an open-woodland community dominated by tree species such as *Corymbia gummifera*, *Angophora costata*, *A. hispidula*, *Eucalyptus haemastoma*, *E. piperita*, *E. punctata* and *E. sieberi*.	
Prostanthera marifolia	Seaforth Mintbush	E	E	*Prostanthera marifolia* is currently only known from the northern Sydney suburb of Seaforth and has a very highly restricted distribution within the Sydney Basin Bioregion. The single population is fragmented by urbanisation into three small sites. All known sites are within an area of 2x2 km. Two of the sites are within the LGA of Manly and one site is in the LGA of Warringah. Occurs in localised patches in or in close proximity to the endangered Duffys Forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised.	Unlikely
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Only one population occurs within a conservation reserve at Georges River National Park. 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 it occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	Unlikely
Pultenaea parviflora	Sydney-bush Pea	V	E	Endemic to the Cumberland Plain the core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. May be locally abundant, particularly within scrubby/dry heath areas of Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. *Eucalyptus fibrosa* is usually the dominant canopy species. *Eucalyptus globoidea*, *E. longifolia*, *E. parramattensis*, *E. sclerophylla* and *E. sideroxylon* may also be present or co-dominant, with Melaleuca decora frequently forming a secondary canopy layer. Associated species may include *Allocasuarina littoralis*, *Angophora bakeri*, Aristida spp., *Banksia spinulosa*, Cryptandra spp., *Daviesia ulicifolia*, *Entolasia stricta*, *Hakea sericea*, *Lissanthe strigosa*, *Melaleuca nodosa*, *Ozothamnus diosmifolius* and *Themeda australis*.	Unlikely
Sarcochilus hartmannii	Hartman's Sarcochilus	V	V	From the Richmond River in northern NSW to Gympie in south-east Queensland. Favours cliff faces on steep narrow ridges supporting eucalypt forest and clefts in volcanic rock from 500 to 1,000 m in altitude. Also found occasionally at the bases of fibrous trunks of trees, including cycads and grass-trees.	Unlikely
Syzygium paniculatum	Magenta Lilly Pilly	V	E	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. 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.	Unlikely
Tetratheca glandulosa	Glandular-pink Bell	V	V	Endemic to NSW, with around about 150 populations from Yengo National Park to Lane Cove National Park. Associates in areas with shale cappings over sandstone. Occurs in heath, scrublands to woodlands and open forest. Common woodland tree species include: *Corymbia gummifera*, *C. eximia*, *Eucalyptus haemastoma*, *E. punctata*, *E. racemosa*, and/or *E. sparsifolia*, with an understorey dominated by species from the families Proteaceae, Fabaceae, and Ericaceae.	Unlikely
Tetratheca juncea	Black-eyed Susan	V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the LGAs of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
				While the species has a preference for cooler southerly aspects, it has been found on slopes with a variety of aspects. It generally prefers well-drained sites and occurs on ridges, although it has also been found on upper slopes, mid-slopes and occasionally in gullies.	
Thesium australe	Austral Toadflax	V	V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	Unlikely
Triplarina imbricata	Creek Triplarina	E	E	Found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. Along watercourses in low open forest with Water Gum (*Tristaniopsis laurina*).	Unlikely
Wilsonia backhousei	Narrow-leaved Wilsonia	-	V	Found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. It grows in all southern states. This is a species of the margins of salt marshes and lakes, both coastal and inland.	Unlikely

Distribution and habitat requirement information adapted from: Australian Government Department of the Environment http://www.environment.gov.au/biodiversity/threatened/index.html, NSW Office of Environment and Heritage http://www.environment.nsw.gov.au/threatenedspecies/

Key:

CE = critically endangered

E = endangered

EP = endangered population

Ex = extinct

V = vulnerable

Threatened fungi Hygrocybe and Camarophyllopsis are not included as the study area does not form part of the known habitat for these species.

Table A.3 : Likelihood of occurrence assessment for threatened terrestrial fauna species

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Birds					
Anseranas semipalmata	Magpie Goose	-	V	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off; breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas; nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW.	Low
Anthochaera phrygia	Regent Honeyeater	CE	CE	Temperate woodlands and open forests of the inland slopes of south-east Australia. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks.	Low
Ardenna carneipes	Flesh-footed Shearwater	M	V	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia. Nest on LHI on sandy soils from Ned's Beach to Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach. Eggs are laid at the end of a burrow 1 - 2 metres in length.	Low
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	V	Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	Low
Botaurus poiciloptilus	Australasian Bittern	E	E	Occurs from south-east Queensland to south-east South Australia, Tasmania and the south-west of Western Australia. The Australasian Bittern's preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate	Low
Burhinus grallarius	Bush Stone-curlew	-	E	Open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Calidris canutus	Red Knot	E, M	-	Common in all the main suitable habitats around the coast of Australia. Mainly inhabit intertidal mudflats, sand flats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	Low
Calidris ferruginea	Curlew Sandpiper	CE	E	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one-year-old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.	Low
Calidris tenuirostris	Great Knot	CE	V	In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sand flats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November.	Low
Calyptorhynchus lathami	Glossy-black Cockatoo	-	V	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 (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of Sheoaks, including Drooping Sheoak, *Allocasuarina diminuta*, and *A. gymnanthera*. Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (Casuarina cristata).	Low
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	V	V	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders.	Low

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	E	V	The Lesser Sand-plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sand flats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Highly gregarious, frequently seen in flocks exceeding 100 individuals; also often seen foraging and roosting with other wader species. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge.	Low
Daphoenositta chrysoptera	Varied Sittella	-	V	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. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Nests in an upright tree fork high in the living tree canopy.	Unlikely
Dasyornis brachypterus	Eastern Bristlebird	E	E	The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern Australia. There are three main populations: Northern - southern Queensland/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	Unlikely
Diomedea antipodensis	Antipodean Albatross	V, M	V	The Antipodean Albatross is endemic to New Zealand, however forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW. It breeds on the New Zealand islands of Antipodes Island, Campbell Island, Pitt Island and the Auckland Islands. This subspecies nests in open patchy vegetation, such as among tussock grassland or shrubs on ridges, slopes and plateaus. On Antipodes Island, they nest in relatively uniform densities, but avoid areas of tall vegetation on steep coastal slopes, or amongst the tall ferns on poorly drained parts of the peaks near the island's centre (Walker & Elliott 2005).	Low
Diomedea antipodensis gibsoni	Gibson's Albatross	V, M	V	In Australian territory, Gibson's Albatross has been recorded foraging between Coffs Harbour, NSW, and Wilson's Promontory, Victoria. Gibson's Albatrosses are rarely observed in the Pacific Ocean or Indian Ocean. The only Australian record of this species is from a recapture off Wollongong, NSW, in September 1997. Gibson's Albatross breeds on Adams Island and Auckland Island, New Zealand. There are no breeding colonies of Gibson's Albatross in Australian territory. This albatross visits Australian waters while foraging and during the non-breeding season.	Low

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Diomedea epomophora	Southern Royal Albatross	V, M	-	During the non-breeding season, the Southern Royal Albatross has a wide and possibly circumpolar distribution, ranging north to about 35°S. The Southern Royal Albatross is moderately common throughout the year in offshore waters of southern Australia, mostly off south-eastern NSW, Victoria and Tasmania. Off South Australia, they are mostly seen May to September. It breeds on Campbell, Adams, Enderby and Auckland Islands, south of New Zealand. Nests on flat or gently sloping ground on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Depressions, gullies, lee slopes and vegetation provide shelter for its nests, but exposed sites are also needed nearby so that the Southern Royal Albatross can take off and land. Its nests are placed among vegetation that is sparse enough for easy access.	Low
Diomedea exulans	Wandering Albatross	V, M	E	The Wandering Albatross breeds on Macquarie Island. Macquarie Island lies in the southwest Pacific Ocean, about half-way between New Zealand and Antarctica. A single breeding pair has also been recorded on Heard Island. The Territory of Heard Island and McDonald Islands are an Australian external territory and volcanic group of barren Antarctic islands, about two-thirds of the way from Madagascar to Antarctica. It feeds in Australian portions of the Southern Ocean. On breeding islands, the Wandering Albatross nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground. Nests of the Wandering Albatross are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off.	Low
Diomedea sanfordi	Northern Royal Albatross	E, M	-	The Northern Royal Albatross ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia. It breeds on Chatham Island and Tiara Head on the South Island of New Zealand. Its habitat includes subantarctic, subtropical, and occasionally Antarctic waters. The Northern Royal Albatross nests on flat or gently sloping ground, on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Depressions, gullies, lee slopes and vegetation provide shelter for its nests, but exposed sites are also needed nearby so that the Southern Royal Albatross can take off and land. Its nests are placed among vegetation that are open enough for adults to easily walk through.	Low
Ephippiorhynchus asiaticus	Black-necked Stork	-	E	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 Bulahdelah. 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. Storks usually forage in water 5-30cm deep for vertebrate and invertebrate prey. Eels regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish). Black-necked Storks build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat).	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Epthianura albifrons	White-fronted Chat White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	-	V, EP	The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, 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. Two isolated sub-populations of White-fronted Chats are currently known from the Sydney Metropolitan Catchment Management Authority (CMA) area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. These sub-populations are separated from each other by 25 km of urbanised land, across which the Chats are unlikely to fly. The nearest extant populations outside Sydney Metropolitan CMA are at Ash Island north of Newcastle and Lake Illawarra, south of Wollongong. White-fronted Chats were previously recorded at Penrith Lakes (2001), Hawkesbury Swamps (2002), Tuggerah Lake (1997) and Lake Macquarie (1998). Regularly observed in the saltmarsh of Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). Current estimates suggest this population consists of 8 individuals. Regularly observed in the saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve. This population is estimated to comprise 19-50 individuals.	Unlikely
Erythrotriorchis radiatus	Red Goshawk	V	CE	This unique Australian endemic raptor is distributed sparsely through northern and eastern Australia, from the western Kimberley Division of northern Western Australia to north-eastern Queensland and south to far north-eastern NSW, and with scattered records in central Australia. The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Unlikely
Esacus magnirostris	Beach Stone-curlew	-	E	In NSW, the species occurs regularly to about the Manning River, and the small population of north-eastern NSW is at the limit of the normal range of the species in Australia. Found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Eudyptula minor	Little Penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)	-	EP	Occurs in Australia and NZ. They generally breed from south of Port Stephens in NSW along the coast through Victoria, South Australia, Tasmania and as far as Fremantle in Western Australia. This endangered population occurs from just north of Smedley's Point to Cannae Point, North Sydney Harbour, Manly.	Unlikely
Fregetta grallaria grallaria	White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian)	V	V	A wide oceanic distribution in the south Pacific and Atlantic Oceans, ranging into tropical waters from various breeding grounds. The White-bellied Storm-Petrel (Tasman Sea) breeds on small offshore islets and rocks in the Lord Howe Island group, including Roach Island and Balls Pyramid. It nests in crevices between large volcanic rocks, and in burrows excavated in banks. Breeding colonies are often situated along dykes. In the non-breeding season, it reaches and forages over near-shore waters along the continental shelf of mainland Australia.	Low
Glossopsitta pusilla	Little Lorikeet	-	V	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in apples (angophora sp.), paperbarks (melaleuca sp.) and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country (e.g. paddocks, roadside remnants) and urban trees also help sustain viable populations of the species.	Low
Grantiella picta	Painted Honeyeater	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	Unlikely
Haematopus fuliginosus	Sooty Oystercatcher	-	V	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels.	Unlikely
Haematopus longirostris	Pied Oystercatcher	-	E	The species is distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Haliaeetus leucogaster	White-bellied Sea-Eagle	M	V	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	Low
Hieraaetus morphnoides	Little Eagle	-	V	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Low
Ixobrychus flavicollis	Black Bittern	-	V	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.	Low
Lathamus discolor	Swift Parrot	CE	E	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta),* Spotted Gum (*Corymbia maculata*), Red Ironbark (*E. sideroxylon*), and White Box (*E. albens*).	Low
Limosa lapponica baueri	Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit	V	V	The bar-tailed godwit (both subspecies combined) has been recorded in the coastal areas of all Australian states. During the non-breeding period, the distribution of bar-tailed godwit (western Alaskan) is predominately New Zealand, northern and eastern Australia. The migratory bar-tailed godwit (western Alaskan) does not breed in Australia. The bar-tailed godwit (western Alaskan) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Low
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri)	CE	V	The bar-tailed godwit (both subspecies combined) has been recorded in the coastal areas of all Australian states. During the non-breeding period, the distribution of L. l. menzbieri is predominantly in the north and north-west of Western Australia and in south-eastern Asia. The migratory bar-tailed godwit (northern Siberian) does not breed in Australia. The bar-tailed godwit (northern Siberian) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Low

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Lophoictinia isura	Square-tailed Kite	-	V	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy large hunting ranges of more than 100 km2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	Low
Macronectes giganteus	Southern Giant Petrel	E, M	E	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	Low
Macronectes halli	Northern Giant Petrel	V, M	V	The Northern Giant-Petrel has a circumpolar pelagic distribution, usually between 40-64ºS in open oceans. Their range extends into subtropical waters (to 28ºS) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies throughout the year (though some do travel widely) while immature birds make long and poorly known circumpolar and trans-oceanic movements. Hence most birds recorded in NSW coastal waters are immature birds. Northern Giant-Petrels seldom breed in colonies but rather as dispersed pairs, often amidst tussocks in dense vegetation and areas of broken terrain.	Low
Neophema chrysogaster	Orange-bellied Parrot	CE	CE	The Orange-bellied Parrot breeds in the south-west of Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern South Australia and southern Victoria. There are occasional reports from NSW, with the most recent records from Shellharbour and Maroubra in May 2003. On the mainland, the Orange-bellied Parrot spends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes. The species also inhabits small islands and peninsulas and occasionally salt works and golf courses. Birds forage in low samphire herbland or taller coastal shrubland.	Unlikely
Nettapus coromandelianus	Cotton Pygmy-Goose	-	E	Although once found from north Queensland to the Hunter River in NSW, the Cotton Pygmy-Goose is now only a rare visitor to NSW. Uncommon in Queensland. Occupies freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation. The Cotton Pygmy-goose uses standing dead trees with hollows close to water for roosting and breeding.	Unlikely
Ninox connivens	Barking Owl	-	V	Found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Ninox strenua	Powerful Owl	-	V	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species.	Low
Numenius madagascariensis	Eastern Curlew	CE, M	-	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats, often with beds of seagrass.	Low
Onychoprion fuscata	Sooty Tern	-	V	The Sooty Tern is found over tropical and sub-tropical seas and on associated islands and cays around Northern Australia. In NSW only known to breed at Lord Howe Island. Occasionally seen along coastal NSW, especially after cyclones. Large flocks can be seen soaring, skimming and dipping but seldom plunging in off shore waters. Breeds in large colonies in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands.	Low
Pachyptila turtur subantarctica	Fairy Prion (southern)	V	-	Fairy Prions (including other subspecies) are often beachcast on the south-eastern coast of Australia, and are commonly seen offshore over the continental shelf and over pelagic waters. The southern subspecies of the Fairy Prion is a marine bird, found mostly in temperate and subantarctic seas. On Macquarie Island and adjacent islets, the burrows of Fairy Prions are usually in crevices, in hollows beneath cushions of *Colobanthus muscoides* or in burrows in peaty soil held together by a thick cover of *Cotula plumosa*.	Low
Pandion cristatus	Eastern Osprey	M	V	The Osprey has a global distribution with four subspecies previously recognised throughout its range. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	Low
Petroica boodang	Scarlet Robin	-	V	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and re-growth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. This species' nest is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	Low
Phoebetria fusca	Sooty Albatross	V, M	V	The Sooty Albatross has sometimes been observed foraging in inshore waters in southern Australia. The Sooty Albatross is a rare, but probably regular migrant to Australia, mostly in the autumn-winter months, occurring north to south-east Queensland, NSW, Victoria, Tasmania and South Australia. The Sooty Albatross breeds on islands in the southern Indian and Atlantic Oceans, and forages south of 30° S, between southern NSW and Argentina.	Low

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Pterodroma leucoptera leucoptera	Gould's Petrel, Australian Gould's Petrel	E, M	V	Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding petrels are unknown. The first arrival of Gould's petrel on cabbage tree Island occurs from mid to late September. Principal nesting habitat is located within two gullies which are characterised by steeply, sloping rock scree with a canopy of Cabbage Tree Palms. They nest predominantly in natural rock crevices among the rock scree and also in hollow fallen palm trunks, under mats of fallen palm fronds and in cavities among the buttresses of fig trees.	Low
Pterodroma neglecta neglecta	Kermadec Petrel (western)	V	V	Ranges over subtropical and tropical waters of the South Pacific. Balls Pyramid (near Lord Howe Island) and Phillip Island (near Norfolk Island) are the only known breeding sites in Australian waters. Breeds on islands across the South Pacific. In Australia it breeds on Ball's Pyramid and Phillip Island (near Norfolk Island). Nests in a crevice amongst rocks.	Low
Ptilinopus superbus	Superb Fruit-dove	-	V	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Unlikely
Rostratula australis	Australian Painted Snipe	E, M	E	Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	Unlikely
Stagonopleura guttata	Diamond Firetail	-	V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (*Eucalyptus pauciflora*) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting.	Unlikely
Sternula albifrons	Little Tern	M	E	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney. Almost exclusively coastal, preferring sheltered environments; however, may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	Low
Sternula nereis nereis	Australian Fairy Tern	V	-	Within Australia, the Fairy Tern occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia; occurring as far north as the Dampier Archipelago near Karratha. The subspecies has been known from New South Wales (NSW) in the past, but it is unknown if it persists there. The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline. The bird roosts on beaches at night.	Low

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Stictonetta naevosa	Freckled Duck	-	V	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	Unlikely
Thalassarche bulleri	Buller's Albatross, Pacific Albatross	V, M	-	Buller's Albatross breed in New Zealand (Snares, Solander and Chatham Islands), but are regular visitors to Australian waters. They are frequently seen off the coast from Coffs Harbour, south to Tasmania and west to Eyre Peninsula. In Australia, Buller's Albatross are seen over inshore, offshore and pelagic waters. They appear to congregate over currents where water temperature exceeds 16 °C.	Low
Thalassarche bulleri platei	Northern Buller's Albatross, Pacific Albatross	V, M	-	The Pacific Albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland. The Pacific Albatross breeds only on Chatham and Three Kings Island, New Zealand, and during this period it is also recorded in the oceanic subtropical east of New Zealand.	Low
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross	V	V	This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and New Zealand provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in Queensland along the entire south coast of the continent to Carnarvon in Western Australia. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park. This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. Occasionally the species occurs in continental shelf waters, in bays and harbours. Known breeding locations include Albatross Island off Tasmania, Auckland Island, Bounty Island and The Snares, off New Zealand, where nesting colonies of 6-500 nests occur and may contain other species such as the Australian Gannet. Located on sheltered sides of islands, on cliffs and ledges, in crevices and slopes, nests are used annually and consist of a mound of mud, bones, plant matter and rocks.	Low
Thalassarche cauta steadi	White-capped Albatross	V, M	-	Breeding colonies occur on islands south of New Zealand. The White-capped Albatross is a marine species and occurs in subantarctic and subtropical waters. The White-capped Albatross is probably common off the coast of south-east Australia throughout the year.	Low
Thalassarche chrysostoma	Grey-headed Albatross	E, M	-	In Australian territory, Grey-headed Albatross breed on the southern and western flanks of Petrel Peak, Macquarie Island. The Grey-headed Albatross has bred in this same restricted area on Macquarie Island for at least the past 30 years. Breeding and non-breeding birds disperse widely across the Southern Ocean, at more southerly latitudes in summer than in winter, when they frequent the waters off southern Australia and New Zealand. Most Australian records come from south and west of Tasmania, occasionally in Victorian waters, rarely in South Australia and Western Australia, and only as a vagrant in NSW.	Low
Thalassarche eremita	Chatham Albatross	E, M	-	Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of New Zealand. The principal foraging range for this species is in coastal waters off eastern and southern New Zealand, and Tasmania.	Low

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	V, M	-	The Campbell Albatross is a non-breeding visitor to Australian waters. Non-breeding birds are most commonly seen foraging over the oceanic continental slopes off Tasmania, Victoria and New South Wales. They breed only on sub-Antarctic Campbell Island (New Zealand), south of New Zealand. After breeding, birds move north and may enter Australia's temperate shelf waters.	Low
Thalassarche melanophris	Black-browed Albatross	M, V	V	The Black-browed Albatross has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park Inhabits Antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents. Can tolerate water temperatures between 0ºC and 24ºC. Spends most of its time at sea, breeding on small isolated islands.	Low
Thalassarche salvini	Salvin's Albatross	V, M	-	Salvin's Albatross breeds on Bounty, Snares and Chatham Islands, south of New Zealand, as well as on Crozet Island in the Indian Ocean. The species forages over most of the southern Pacific Ocean, where it is particularly common in the Humboldt Current, off South America. There are small numbers in the Indian Ocean and sometimes in the South Atlantic Ocean. During the non-breeding season, the species occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays (Jehl 1973). Salvin's Albatross is scarce in pelagic waters.	Low
Tyto tenebricosa	Sooty Owl	-	V	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	Unlikely
Mammals					
Aepyprymnus rufescens	Rufous Bettong	-	V	In NSW it has largely vanished from inland areas but there are sporadic, unconfirmed records from the Pilliga and Torrington districts. Rufous Bettongs inhabit a variety of forests from tall, moist eucalypt forest to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	Unlikely
Cercartetus nanus	Eastern Pygmy-possum	-	V	Found in a broad range of habitats from rainforest through to wet and dry sclerophyll forest and woodland to heath, but in most areas woodlands and heath appear to be preferred.	Unlikely
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Forages over a broad range of open forest and woodland habitats, this species is a cave roosting bat which favours sandstone escarpment habitats for roosting, in the form of shallow overhangs, crevices and caves.	Low
Dasyurus maculatus	Spotted-tailed Quoll	E	V	Wet and dry sclerophyll forests and rainforests, and adjacent open agricultural areas. Generally associated with large expansive areas of habitat to sustain territory size. Requires hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Falsistrellus tasmaniensis	Eastern False Pipistrelle	-	V	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Low
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	E	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	Low
Miniopterus australis	Little Bentwing-bat	-	V	East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. Little Bentwing-bats roost 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.	Low
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	-	V	Occurs on east and north west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other manmade structures.	Moderate
Mormopterus norfolkensis	Eastern Freetail-bat	-	V	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in human-made structures.	Low
Myotis macropus	Southern Myotis	-	V	Generally roost in groups close to water in caves, mine shafts, hollow-bearing trees, and storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish.	Low
Perameles nasuta	Long-nosed Bandicoot population in inner western Sydney Long-nosed Bandicoot, North Head	-	EP	Inner west population - the exact area occupied by the population is not clearly defined, and includes the local government areas (LGA) of Marrickville and Canada Bay, with the likelihood that it also includes Canterbury, Ashfield and Leichhardt LGAs. Future research may better define the population and possibly indicate a wider distribution. This population is disjunct from the nearest records of the Long-nosed Bandicoot, which occur north of the Parramatta River or much further south at Holsworthy Military Reserve. Shelter mostly under older houses and buildings. There are apparently no large blocks of suitable habitat, likely to support a large source population, on the Cooks River to the south, or along the southern foreshore of Parramatta River and Sydney Harbour to the north. North Head population - Restricted to North Head in the Manly Local Government Area. Essentially a solitary animal that occupies a variety of habitats on North Head. Forages mainly at or after dusk, digging for invertebrates, fungi and tubers. The conical holes it leaves in the soil are often seen at the interface of naturally vegetated and areas of open grass around the Quarantine Station, former Defence Lands and Saint Patrick's Estate. Shelters during the day in a well-concealed nest based on a shallow hole lined with leaves and grass, sometimes under debris, sometimes hidden with soil and with the entrance closed for greater concealment.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Petauroides volans	Greater Glider	V	-	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria from sea level to 1200 m altitude. It feeds exclusively on eucalypt leaves, buds, flowers and mistletoe and favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. It roosts in tree hollows, with a particular selection for large hollows in large, old trees. Individuals use multiple hollows and a relatively high abundance of tree hollows (at least 4-8 suitable hollows per hectare) seems to be needed for the species to persist. Individuals occupy relatively small home ranges with an average size of 1 to 3 ha but the species has relatively low persistence in small forest fragments, and disperses poorly across vegetation that is not native forest. Forest patches of at least 160 km^2 may be required to maintain viable populations.	Unlikely
Petaurus australis	Yellow-bellied Glider	-	V	Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar.	Unlikely
Petrogale penicillata	Brush-tailed Rock-wallaby	V	E	Range extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	Unlikely
Phascolarctos cinereus	Koala (combined populations of Qld, NSW and the ACT)	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. 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.	Unlikely
Pseudomys novaehollandiae	New Holland Mouse, Pookila	V	-	Distribution is fragmented across all eastern states of Australia, where it inhabits open heath lands, open woodlands with heath understorey and vegetated sand dunes.	Unlikely
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur 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. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	Known to forage in the development site

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	V	Wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	Low
Reptiles					
Hoplocephalus bungaroides	Broad-headed Snake	V	V	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	Unlikely
Varanus rosenbergi	Rosenberg's Goanna				Unlikely
Amphibians					
Heleioporus australiacus	Giant Burrowing Frog	V	V	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size.	Unlikely
Litoria aurea	Green and Golden Bell Frog	V	E	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Ephemeral and permanent freshwater wetlands, ponds, dams with an open aspect and fringed by Typha and other aquatics, free from predatory fish.	Unlikely
Mixophyes balbus	Stuttering Frog	V	V	Occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	Unlikely
Pseudophryne australis	Red-crowned Toadlet	-	V	It has restricted distribution from Pokolbin to Nowra and west to Mt Victoria. Occurs in open forests and wet drainage lines below sandstone ridges that often have shale lenses or cappings in the Hawkesbury and Narrabeen Sandstones.	Unlikely
Invertebrates					

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Pommerhelix duralensis	Dural Land Snail	E	E	The Dural land snail is endemic to New South Wales. The species is a shale-influenced habitat specialist, which occurs in low densities along the northwest fringe of the Cumberland Plain on shale-sandstone transitional landscapes. The species has been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	Unlikely
Migratory marine birds					
Anous stolidus	Common Noddy	M	-	In Australia, the Common Noddy occurs mainly in ocean off the Queensland coast, but the species also occurs off the north-west and central Western Australia coast. The species is also rarely encountered off the coast of the Northern Territory, where only one breeding location with about 100-130 birds is known. During the non-breeding period, the species occurs in groups throughout the pelagic zone (open ocean).	Unlikely
Apus pacificus	Fork-tailed Swift	M	-	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground.	Moderate
Ardenna carneipes	Flesh-footed Shearwater, Fleshy-footed Shearwater	M	V	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia. Nest on LHI on sandy soils from Ned's Beach to Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach. Eggs are laid at the end of a burrow 1 - 2 metres in length.	Unlikely
Calonectris leucomelas	Streaked Shearwater	M	-	Found in the western Pacific, breeding on the coast and on offshore islands of Japan, Russia, and on islands off the coasts of China, North Korea and South Korea. This marine species can be found over both pelagic and inshore waters.	Unlikely
Diomedea epomophora	Southern Royal Albatross	V, M	-	During the non-breeding season, the Southern Royal Albatross has a wide and possibly circumpolar distribution, ranging north to about 35°S. The Southern Royal Albatross is moderately common throughout the year in offshore waters of southern Australia, mostly off south-eastern NSW, Victoria and Tasmania. Off South Australia, they are mostly seen May to September. It breeds on Campbell, Adams, Enderby and Auckland Islands, south of New Zealand. Nests on flat or gently sloping ground on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Depressions, gullies, lee slopes and vegetation provide shelter for its nests, but exposed sites are also needed nearby so that the Southern Royal Albatross can take off and land. Its nests are placed among vegetation that is sparse enough for easy access.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Diomedea exulans	Wandering Albatross	V, M	E	The Wandering Albatross breeds on Macquarie Island. Macquarie Island lies in the southwest Pacific Ocean, about half-way between New Zealand and Antarctica. A single breeding pair has also been recorded on Heard Island. The Territory of Heard Island and McDonald Islands are an Australian external territory and volcanic group of barren Antarctic islands, about two-thirds of the way from Madagascar to Antarctica. It feeds in Australian portions of the Southern Ocean. On breeding islands, the Wandering Albatross nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground. Nests of the Wandering Albatross are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off.	Unlikely
Fregata ariel	Lesser Frigatebird, Least Frigatebird	M	-	Major breeding populations of the Lesser Frigatebird are found in tropical waters of the Indian and Pacific Ocean (excluding the east Pacific), as well as one population in the South Atlantic (Trinidade and Martim Vaz, Brazil). Outside the breeding season it is sedentary, with immature and non-breeding individuals dispering throughout tropical seas, especially of the Indian and Pacific Oceans.	Unlikely
Fregata minor	Great Frigatebird, Greater Frigatebird	M	-	Major breeding populations of the Great Frigatebird are found in tropical waters of the Pacific and Indian Ocean, as well as one population in the South Atlantic (Trinidade and Martim Vaz, Brazil). It is predominately sedentary, with immature and non-breeding individuals dispersing throughout the tropical seas with the exception of the east and central Atlantic.	Unlikely
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	E, M	E	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	Unlikely
Macronectes halli	Northern Giant Petrel	V, M	V	The Northern Giant-Petrel has a circumpolar pelagic distribution, usually between 40-64ºS in open oceans. Their range extends into subtropical waters (to 28ºS) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies throughout the year (though some do travel widely) while immature birds make long and poorly known circumpolar and trans-oceanic movements. Hence most birds recorded in NSW coastal waters are immature birds. Northern Giant-Petrels seldom breed in colonies but rather as dispersed pairs, often amidst tussocks in dense vegetation and areas of broken terrain.	Unlikely
Phoebetria fusca	Sooty Albatross	V, M	V	The Sooty Albatross has sometimes been observed foraging in inshore waters in southern Australia. The Sooty Albatross is a rare, but probably regular migrant to Australia, mostly in the autumn-winter months, occurring north to south-east Queensland, NSW, Victoria, Tasmania and South Australia. The Sooty Albatross breeds on islands in the southern Indian and Atlantic Oceans, and forages south of 30° S, between southern NSW and Argentina.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Sternula albifrons	Little Tern	M	E	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	Unlikely
Thalassarche bulleri	Buller's Albatross, Pacific Albatross	V, M	-	Buller's Albatross breed in New Zealand (Snares, Solander and Chatham Islands), but are regular visitors to Australian waters. They are frequently seen off the coast from Coffs Harbour, south to Tasmania and west to Eyre Peninsula. In Australia, Buller's Albatross are seen over inshore, offshore and pelagic waters. They appear to congregate over currents where water temperature exceeds 16 °C.	Unlikely
Thalassarche cauta	Tasmanian Shy Albatross	V, M	V	This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and New Zealand provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in Queensland along the entire south coast of the continent to Carnarvon in Western Australia. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park. This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. Occasionally the species occurs in continental shelf waters, in bays and harbours. Known breeding locations include Albatross Island off Tasmania, Auckland Island, Bounty Island and The Snares, off New Zealand, where nesting colonies of 6-500 nests occur and may contain other species such as the Australian Gannet. Located on sheltered sides of islands, on cliffs and ledges, in crevices and slopes, nests are used annually and consist of a mound of mud, bones, plant matter and rocks.	Unlikely
Thalassarche melanophris	Black-browed Albatross	M, V	V	The Black-browed Albatross has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park Inhabits Antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents. Can tolerate water temperatures between 0ºC and 24ºC. Spends most of its time at sea, breeding on small isolated islands.	Unlikely
Migratory terrestrial species					
Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo	M	-	Migrates from Eurasia as far south as Indonesia, New Guinea and North Australia. Some remain through Australia in the winter. Inhabits rainforest margins, monsoon forest, vine scrub and mangroves.	Low
Hirundapus caudacutus	White-throated Needletail	M	-	Widespread in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.	Moderate

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Monarcha melanopsis	Black-faced Monarch	M	-	Widespread in eastern Australia. Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	Low
Monarcha trivirgatus	Spectacled Monarch	M	-	Occurs along the entire east coast of Australia. Breeds in dense scrub in gullies of coastal ranges.	Low
Motacilla flava	Yellow Wagtail	M	-	Rare but regular visitor around Australian coast, especially in the NW coast Broome to Darwin. Found in open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground; occasionally on drier inland plains.	Low
Myiagra cyanoleuca	Satin Flycatcher	M	-	Widespread in eastern Australia and vagrant to New Zealand. 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.	Low
Rhipidura rufifrons	Rufous Fantail	M	-	Occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns.	Low
Migratory wetlands species					
Actitis hypoleucos	Common Sandpiper	M	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	Unlikely
Arenaria interpres	Ruddy Turnstone	M	-	Coastline and only occasionally inland. They are mainly found on exposed rocks or reefs, often with shallow pools, and on beaches.	Unlikely
Calidris acuminata	Sharp-tailed Sandpiper	M	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Unlikely
Calidris alba	Sanderling	M	V	A regular summer migrant from Siberia and other Arctic breeding grounds to most of the Australian coastline. It is uncommon to locally common, arriving from September and leaving by May (some may overwinter in Australia). Sanderlings occur along the NSW coast, with occasional inland sightings. Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Calidris canutus	Red Knot, Knot	E, M	-	Common in all the main suitable habitats around the coast of Australia. Mainly inhabit intertidal mudflats, sand flats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	Unlikely
Calidris ferruginea	Curlew Sandpipe	CE	E	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one year old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.	Unlikely
Calidris melanotos	Pectoral Sandpiper	M	-	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely
Calidris ruficollis	Red-necked Stint	M	-	It is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. The Red-necked Stint breeds in Siberia and sporadically in north and west Alaska, probably from Taymyr region to Anadyr Territory and Koryakland. The Red-necked Stint mostly forages on bare wet mud on intertidal mudflats or sand flats, or in very shallow water; mostly in areas with a film of surface water and mostly close to edge of water. Roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation.	Unlikely
Calidris subminuta	Long-toed Stint	M	-	The Long-toed Stint is a regular summer visitor to Australia, but uncommon in the east. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire.	Unlikely
Calidris tenuirostris	Great Knot	M	V	In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sand flats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Charadrius bicinctus	Double-banded Plover	M	-	The Double-banded Plover can be found in both coastal and inland areas. The Double-banded Plover is found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers.	Unlikely
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	-	V	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders.	Unlikely
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	M	V	The Lesser Sand-plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sand flats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Highly gregarious, frequently seen in flocks exceeding 100 individuals; also often seen foraging and roosting with other wader species. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge.	Unlikely
Charadrius veredus	Oriental Plover, Oriental Dotterel	M	-	The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the north-western coast, between Exmouth Gulf and Derby in Western Australia, and there are records at a few scattered sites elsewhere, mainly along the northern coast, such as in the Top End, the Gulf of Carpentaria and on Cape York Peninsula. Forage among short grass or on hard stony bare ground, but also on mudflats or among beach-cast seaweed on beaches. Sometimes roost on soft wet mud or in shallow water of beaches and tidal mudflats, and also occasionally in dry, open habitats, such as saltmarsh or paddocks.	Unlikely
Gallinago hardwickii	Latham's Snipe	M	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	Unlikely
Gallinago megala	Swinhoe's Snipe	M	-	Few definite records exist for Swinhoe's Snipe in Australia. The species has been recorded in the north between the Kimberley Divide and Cape York Peninsula. Breeds in central and southern Siberia. During the non-breeding season Swinhoe's Snipe occurs at the edges of wetlands, such as wet paddy fields, swamps and freshwater streams. The species is also known to occur in grasslands and drier cultivated areas.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Gallinago stenura	Pin-tailed Snipe	M	-	The species distribution within Australia is not well understood. In NSW a single banded bird was reported near West Wyalong. Non-breeding migrant in Australia. During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation.	Unlikely
Limicola falcinellus	Broad-billed Sandpiper	M	V	The eastern form of this species breeds in northern Siberia before migrating southwards in winter to Australia. In Australia, Broad-billed Sandpipers overwinter on the northern coast, particularly in the north-west, with birds located occasionally on the southern coast. In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW. Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sand flats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	Unlikely
Limosa lapponica	Bar-tailed Godwit	M	-	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sand flats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Unlikely
Limosa limosa	Black-tailed Godwit	M	V	A migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently found at Kooragang Island (Hunter River estuary). Occurs in sheltered bays, estuaries and lagoons with large intertidal mudflats and sand flats. Also found at inland mudflats, swamps.	Unlikely
Numenius madagascariensis	Eastern Curlew	CE, M	-	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats, often with beds of seagrass.	Unlikely
Numenius minutus	Little Curlew	M	-	Little Curlews generally spend the non-breeding season in northern Australia from Port Hedland in Western Australia to the Queensland coast. The Little Curlew is most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated.	Unlikely
Numenius phaeopus	Whimbrel	M	-	The Whimbrel is a regular migrant to Australia and New Zealand, with a primarily coastal distribution. The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats.	Unlikely
Pandion haliaetus (*cristatus*)	Eastern Osprey	M	V	The Osprey has a global distribution with four subspecies previously recognised throughout its range. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	Unlikely

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Philomachus pugnax	Ruff	M	-	The Ruff is a rare but regular non-breeding visitor to Australia, being recorded in all States and Territories. In NSW the species has been recorded at Kurnell, Tomki, Casino, Ballina, Kooragang Island, Broadwater Lagoon and Little Cattai Creek. The Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges.	Unlikely
Pluvialis fulva	Pacific Golden Plover	M	-	Most Pacific Golden Plovers occur along the east coast, and are especially widespread along the Queensland and NSW coastlines. In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sand flats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in salt works.	Unlikely
Pluvialis squatarola	Grey Plover	M	-	Non-breeding visitor to Australia, Grey Plovers usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons. They usually roost in sandy areas, such as on unvegetated sandbanks or sand-spits on sheltered beaches or other sheltered environments such as estuaries or lagoons	Unlikely
Tringa brevipes	Grey-tailed Tattler	M	-	In NSW the Grey-tailed Tattler is distributed along most of the coast from the Queensland border, south to Tilba Lake. The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide.	Unlikely
Tringa incana	Wandering Tattler	M	-	The Wandering Tattler is a vagrant in the East Asian-Australasian Flyway and is uncommon in Australia, although it may sometimes be overlooked. The Wandering Tattler does not breed in Australia. The Wandering Tattler is generally found on rocky coasts with reefs and platforms, points, spits, piers, offshore islands and shingle beaches or beds	Unlikely
Tringa nebularia	Common Greenshank	M	-	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia.	Unlikely
Tringa stagnatilis	Marsh Sandpiper	M	-	Fresh or brackish (slightly salty) wetlands such as rivers, water meadows, sewage farms, drains, lagoons and swamps.	Unlikely
Xenus cinereus	Terek Sandpiper	M	V	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. The latter has been identified as nationally and internationally important for the species. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mud banks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	Unlikely
Merops ornatus	Rainbow Bee-eater	M	-	Distributed across much of mainland Australia, and occurs on several near-shore islands. Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation.	Low

Species name	Common name	EPBC Act	BC Act	Distribution and habitat	Likelihood of occurrence
Distribution and habitat requirement information adapted from: Australian Government Department of the Environment http://www.environment.gov.au/biodiversity/threatened/index.html NSW Office of Environment and Heritage http://www.environment.nsw.gov.au/threatenedspecies/ Key: CE = critically endangered E = endangered V = vulnerable M = migratory					

Appendix B. Assessment of significance

For threatened biodiversity listed under the EPBC Act, significance assessments have been completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of Environment 2013). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts (Department of Environment 2013). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility (Department of Environment 2013). This advice has been considered while undertaking the assessments.

B.1 Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is known to use the planted vegetation in the development site for foraging. No roost camps are present in the development site but the bats from the Centennial Park camp do forage in the development site. Planted trees including *Corymbia maculata, Eucalyptus tereticornis, Eucalyptus saligna*, and *Lophostemon confertus* provide a floral foraging resource. Trees including *Archontophoenix cunninghamiana, Livistona australis, Ficus macrophylla, Ficus rubiginosa, Ficus microcarpa* var. *hillii* and *Phoenix canariensis* provide a fruiting resource.

The Grey-headed Flying-fox exists as one interconnected population along the eastern Australian coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. As a result, for this assessment, the impact has been considered in terms of 'important habitat' as opposed the presence of an 'important population'.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

1) lead to a long-term decrease in the size of an important population of a species

There are no roost camps in the development site and the project would not affect any known permanent roosting, breeding / maternity site. Therefore, it is likely that the impacts of construction and operation of the project would be confined to minor loss of foraging habitat caused by direct clearing or damage to vegetation during the construction phase.

The project would remove approximately 0.62 hectares (6,185 m^2) of foraging habitat but not all vegetation in the development site will be removed. The proportional impact would be negligible at 0.5% of the available foraging resource in the immediately surrounding urban habitat. Given the relatively widespread nature of similar native vegetation and planted vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of local individuals, the project is not expected to significantly affect important habitat or lead to a long-term decrease in the size of an important population.

2) reduce the area of occupancy of an important population

The area of occupancy of the Grey-headed Flying-fox is not known but the species exists as one interconnected population along the eastern Australian coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. The area occupied by this species would remain the same after the project. No decrease in the area of occupancy for this species expected as a result of the project.

3) fragment an existing important population into two or more populations

Highly mobile species such as bats are expected to be less impacted by fragmentation. The Grey-headed Flying-fox is particularly well adapted to accessing widely spaced habitat resources given its mobility and preference for seasonal fruits and blossom in differing parts of the landscape. The project would not fragment an important population of the Grey-headed Flying-fox. Individuals would still be able to disperse between roosts along the east Australian coast. Genetic exchange within the population and dispersal would not be disrupted by the project.

4) adversely affect habitat critical to the survival of a species

This species typically exhibits very large home range and Grey-headed Flying-fox is known to travel distances of at least 50 kilometres from roost sites to access seasonal foraging resources. There are no known roost camps within the development site and the site does not provide typical or likely roosting habitat. However, there are a number of known roost camps with a 50km radius of the project, the closest being the Centennial Park camp. The draft recovery plan for the Grey-headed Flying-fox identifies critical foraging habitat for this species as:

- Productive during winter and spring, when food bottlenecks have been identified
- Known to support populations of >30,000 individuals, within an area of 50 kilometre radius of a camp site
- Productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (Sept-May)
- Productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes
- Known to be continuously occupied as a camp site.

The foraging habitat in the development site is unlikely to constitute critical foraging habitat. Given the extensive nature of high quality foraging habitats within the range of the bats in the Centennial Park camp, the project is not expected to adversely affect foraging habitat critical to the survival of this species in this region.

5) disrupt the breeding cycle of an important population

As stated above there would be a minor impact on foraging habitat but the project would not directly impact on a known or likely roost camp / breeding or maternity site. Extensive foraging resources are available in the locality that would provide suitable resources during the maternity season. The habitats in the development site are not limiting for this species.

6) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The impacts to foraging habitat are minimal at 0.5% of the available foraging resource in the immediately surrounding area and no evidence of a current or potential roost camp site has been identified from the development site. The project is not expected to lead to a decline in the species in this region considering the magnitude of this impact and the expanse of high quality foraging habitat available to local animals.

7) result in invasive species that are harmful to a vulnerable species becoming established in the Vulnerable species' habitat

The project is unlikely to result in an invasive species harmful to the Grey-headed Flying-fox becoming established in the habitat. The potential for weed invasion with a project of this nature is minimal given the site context.

8) introduce disease that may cause the species to decline, or

There are no known disease issues affecting this species of relevance to the project. The project would be unlikely to increase the potential for significant disease vectors to affect local populations.

9) interfere substantially with the recovery of the species.

The *Draft National Recovery Plan for the Grey-headed Flying-fox* (*Pteropus poliocephalus*) (Department of Environment Climate Change and Water 2009) outlines the following actions:

- Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes across their range
- Enhance winter and spring foraging habitat for Grey-headed Flying-foxes
- Identify, protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes

- Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture
- Provide information and advice to managers, community groups and members of the public that are involved with controversial flying-fox camps
- Produce and circulate educational resources to improve public attitudes toward Grey-headed Flying-foxes, promote the recovery program to the wider community and encourage participation in recovery actions
- Monitor population trends for the Grey-headed Flying-fox
- Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts
- Oversee a program of research to improve knowledge of the demographics and population structure of the Grey-headed Flying-fox
- Maintain a National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan

The recovery actions listed above are largely not applicable to the project and the project is not expected to interfere substantially with the recovery of the species.

Conclusion

The Grey-headed Flying-fox would suffer a small reduction in extent of suitable foraging habitat from the project. No breeding camps or other important habitat would be impacted. The project is unlikely to reduce the population size of the Grey-headed Flying-fox or decrease the reproductive success of this species. The project would not interfere with the recovery of the Grey-headed Flying-fox and would not contribute to the key threats to this species. After consideration of the factors above, an overall conclusion has been made that the project is unlikely to result in a significant impact to the Grey-headed Flying-fox.