

TRANSPORT FOR NSW

# BEXLEY NORTH STATION UPGRADE BIODIVERSITY ASSESSMENT REPORT

JANUARY 2019



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## Bexley North Station Upgrade Biodiversity Assessment Report

Transport for NSW

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# GLOSSARY

*	Denotes exotic species
BAM	Biodiversity Assessment Methodology 2017 that supports the <i>Biodiversity Conservation Act 2016</i> .
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: <ul style="list-style-type: none"><li>— Genetic diversity — the variety of genes (or units of heredity) in any population.</li><li>— Species diversity — the variety of species.</li><li>— Ecosystem diversity — the variety of communities or ecosystems.</li></ul>
Bioregion (region)	A bioregion defined in a national system of bioregionalisation. The site is in the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell 1995).
Candidate species	Species assessed as having a moderate to high likelihood of occurrence within the study area.
Critical habitat	The whole or any part or parts of an area or areas of land comprising the habitat of an Endangered species, an Endangered population or an Endangered Ecological Community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004). Critical habitat is listed under the EPBC Act with the Secretary (Department of the Environment and Energy) maintaining a register of this habitat. Capitalisation of the term ‘Critical Habitat’ in this report refers to the habitat listed specifically under Commonwealth legislation.
Cryptic species	An inconspicuous species which can be difficult to identify
Department of the Environment and Energy	The department develops and implements national policy, programs and legislation to protect and conserve Australia’s natural environment and cultural heritage and administers the EPBC Act. The Commonwealth Department of the Environment was previously known as: <ul style="list-style-type: none"><li>— Department of Sustainability, Environment, Water, Population and Communities (SEWPAC)</li><li>— Department of the Environment, Water, Heritage and the Arts (DEWHA).</li><li>— Department of Environment and Heritage (DEH).</li><li>— Department of the Environment and Water Resources (DEWR).</li></ul>
Ecological community	An assemblage of species occupying a particular area.
Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.
Exotic	Introduced from outside the area (Stralberg, Jongsomjit et al. 2009). Used in the context of this report to refer to species introduced from overseas.
GPS	Global Positioning System – a navigational tool which uses radio receivers to pick up signals from four or more special satellites to provide precise determination of location.

Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic components.
High Threat Weed	Vascular plants not native to Australia that if not controlled will invade and outcompete native species. A list of high threat weeds is available as part of the BAM Calculator ( <a href="https://www.lmbc.nsw.gov.au/bamcalc">https://www.lmbc.nsw.gov.au/bamcalc</a> )
Indigenous	Native to the area: not introduced (Stralberg, Jongsomjit et al. 2009).
Introduced	Not native to the area: not indigenous (Stralberg, Jongsomjit et al. 2009). Refers to both exotic and non-indigenous Australian native species of plants and animals.
Key threatening processes	A process that threatens, or could threaten, the survival, abundance or evolutionary development of native species, populations or ecological communities (Department of Environment and Conservation 2004). Key threatening processes are listed under the TSC Act, the FM Act and the EPBC Act. Capitalisation of the term ‘Key Threatening Processes’ in this report refers to those processes listed specifically under the relevant state and Commonwealth legislation.
Likely	Taken to be a real chance or possibility (Department of Environment and Conservation 2004).
Local population	The population that occurs within the site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated as defined by Department of Environment and Climate Change (2007).
Locality	The area within a 10 kilometre radius of the study area.
Migratory species	Species listed as Migratory under the EPBC Act relating to international agreements to which Australia is a signatory. These include Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Capitalisation of the term ‘Migratory’ in this report refers to those species listed as Migratory under the EPBC Act.
NSW	New South Wales
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.
Priorities action statements (PAS)	Priorities action statements outline the broad strategies and detailed priority actions to be undertaken in NSW to promote the recovery of Threatened species, population and ecological communities and manage key threatening processes (Department of Environment and Climate Change 2007).
Priority Weeds	An introduced species listed under the <i>Biosecurity Act 2015</i> . Under the Act, priority weeds have specific control measures for each region.
Proposal	The proposed works as described in detail in Section 1.2.
Protected species	Those species defined as protected under the <i>National Parks and Wildlife Act 1974</i> . Includes all native animals, as well as all native plants listed on Schedule 13 of the <i>National Parks and Wildlife Act 1974</i> .

Region	A bioregion defined in a national system of bioregionalisation. The Proposal is located within the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995).
Significant	Important, weighty or more than ordinary
Species richness	Species richness is simply the number of species present in a sample, community, or taxonomic group. Species richness is one component of the concept of species diversity, which also incorporates evenness, that is, the relative abundance of species (Matteson and Langellotto 2010).
Threatened biodiversity	Threatened species, populations or ecological communities as listed under the BC Act, FM Act or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as threatened) under the TSC Act, FM Act or the EPBC Act. Capitalisation of the terms 'Vulnerable', 'Endangered' or 'Critically Endangered' in this report refers to listing under the relevant state and/or Commonwealth legislation.
Viable local population	A population that has the capacity to live, develop and reproduce under normal conditions, unless the contrary can be conclusively demonstrated through analysis of records and references (Department of Environment and Climate Change 2007).
Weed	A plant growing out of place or where it is not wanted: often characterised by high seed production and the ability to colonise disturbed ground quickly (Stralberg, Jongsomjit et al. 2009). Weeds include both exotic and Australian native species of plant naturalised outside of their natural range.

# ABBREVIATIONS

BC Act	<i>NSW Biodiversity Conservation Act 2016</i>
BAM	Biodiversity Assessment Methodology (2017)
CAMBA	China Australia Migratory Bird Agreement
EEC	Endangered Ecological Community
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	<i>NSW Fisheries Management Act 1994</i>
HA	Hectares
JAMBA	Japan Australia Migratory Bird Agreement
LEP	Local Environmental Plan
MENS	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
RoKAMBA	Republic of Korea Australia Migratory Bird Agreement
TSC Act	<i>NSW Threatened Species Conservation Act 1995.</i>



# 1 PROPOSAL BACKGROUND

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## 1.1 PURPOSE OF THIS REPORT

Transport for NSW (TfNSW) has identified the need to undertake a Biodiversity Assessment Report to inform the Review Environmental Factors (REF) for the Bexley North Station Upgrade (the Proposal). This Biodiversity Assessment Report has been prepared to test if the proposed activity is likely to significantly affect threatened species in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act). This report will also determine if a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) must accompany the environmental assessment (REF) under Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The key aims of this Biodiversity Assessment Report are to:

- present the results of desk-based and field-based investigations on biodiversity values within the study area
- provide a description of the biodiversity values and conservation significance within the study area
- undertake an evaluation of any impacts associated with the proposal (on the study area) including associated works implementing vegetation management actions
- undertake assessments of significance within the study area (five-part tests) as prescribed under Section 7.3 of the BC Act
- determine if a Species Impact Statement or Biodiversity Development Assessment must accompany the environmental assessment under Section 7.8 of the BC Act
- recommend relevant mitigation and management measures to minimise any impacts on biodiversity values within the study area.

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## 1.2 BACKGROUND AND DESCRIPTION OF THE PROPOSAL

The Proposal involves an upgrade of Bexley North Station as part of the Transport Access Program which would improve accessibility and amenity for customers.

The Proposal would include the following key elements:

- provision of a new station entrance from the Bexley Road overbridge. The new station entrance would include:
  - demolition of the existing stairs and the eastern platform canopy in order to accommodate the new stairs, lift and entrance landing
  - construction of a new station entrance landing area
  - construction of a new lift between Bexley Road and the station platform
  - construction of new stairs between the landing and the station platform
  - construction of a replacement stair and platform canopy
- internal station building works including:
  - construction of a new family accessible toilet in the location of the existing male toilets
  - construction of a new unisex ambulant toilet at the location of the existing female toilets
  - other minor building modifications required to accommodate new electrical equipment including a main switchboard, and new or upgraded station communications equipment

- upgrade of existing platform surfaces (re-grading/re-surfacing) at locations across platforms to provide compliant accessible paths and ramps to station amenities
- upgrade of the existing commuter carpark on Kingsgrove Avenue including:
  - reconfiguration of the existing car park to allow for 22 parking spaces, including two accessible parking spaces. Note this would result in a net loss of 11 parking spaces from the existing configuration
  - an accessible ramp from the commuter carpark to the Bexley Road overbridge
  - increased car park aisle width and turning vehicle area
- landscaping and planting works within the station precinct
- upgrade of the existing footpaths to the north and south of the station entrance along the Bexley Road overbridge, including minor re-grading of footpaths and installation of landings
- power supply upgrades including modification to the existing station 11kV padmount transformer, construction of a new containment and submain cable including an underline crossing, and connection to the new main switchboard in the station building
- ancillary works including adjustments to fencing, retaining walls, crash barriers, lighting, electrical upgrades, electronic ticketing, new seating, relocation of rubbish bins, improvement to station communications and security systems (including CCTV cameras), public address system, hearing induction loops, station passenger information, wayfinding signage and installation of tactile ground surface indicators (TGSIs).

Figure 1.1 shows the general layout of key elements for the Proposal.

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## 1.3 LOCATION OF THE PROPOSAL

The Proposal would involve upgrade works to Bexley North Station, approximately 12 kilometres south west of Sydney's Central Business District (CBD). The regional context of the Proposal is shown in Figure 1.1.

The Proposal is in the suburb of Bexley North and the Bayside Local Government Area (LGA), to which the Rockdale Local Environmental Plan 2011 (Rockdale LEP) applies. Bexley North Station is surrounded a combination of urban land uses including various commercial buildings, mixed use development and low density housing to the south and low density housing and public recreation to the north.

The Bexley North Library is also located immediately south of the station (shown in Figure 1.1).



Figure 1.1 Location of the Proposal



## 2 LEGISLATIVE CONTEXT

Local Government, State and Commonwealth legislation and planning controls relevant to the protection of biodiversity and this Proposal are outlined briefly in this section. These statutory instruments provide conditions, matters for consideration and requirements to seek authorisation (licenses and approvals) to undertake various actions and activities.

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### 2.1 STATE LEGISLATION

#### 2.1.1 BIODIVERSITY CONSERVATION ACT 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act) came into effect on the 25 August 2017. This Act repealed the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

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

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### 2.2 COMMONWEALTH LEGISLATION

#### 2.2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), any action that has, would have, or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) or on Commonwealth land, triggers the Act and may require assessment and approval from the Commonwealth Minister for the Environment.

The nine matters of national environmental significance protected under the EPBC Act are:

- listed threatened species and ecological communities
- listed migratory species
- wetlands of international importance (listed under the Ramsar Convention)
- commonwealth marine areas
- world heritage properties
- national heritage places
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

# 3 METHODOLOGY

## 3.1 DEFINITIONS

For this report the following definitions apply:

- study area: defined as the area in which the proposal is to occur
- locality: is a 10-kilometre radius from the study area.
- bioregion: for this study, the bioregion is the Sydney Basin as defined in the *Interim Biogeographic Regionalisation for Australia* (Thackway and Cresswell 1995).

All other definitions are provided in the glossary at the start of this document. The Proposal locality and study area are shown in Figure 1.1

## 3.2 PERSONNEL

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

Table 3.1 Contributors and their roles

NAME	QUALIFICATION	ROLE
Mark Stables	Bachelor of Science (Hons) BAM accredited assessor	Principal Ecologist – survey and report preparation.
Alex Cockerill	Bachelor of Science (Hons) BAM accredited assessor	Ecology National Team Executive – Technical review
Jarryd Barton	Bachelor of Planning (Hons) Certified Environmental Practitioner (CEnvP)	Quality control and review

All work was carried out under the appropriate licences, including a scientific licence as required under Part 2 of the NSW BC Act (License Number: SL100630), and an Animal Research Authority issued by the Department of Primary Industries (Agriculture).

## 3.3 NOMENCLATURE

Names of vegetation communities used in this report are based on the Plant Community Types (PCTs) used in the BioNet Vegetation Classification (Office of Environment & Heritage 2018).

These names are cross-referenced with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act. They are also cross-referenced with existing vegetation mapping using dominant species and structure of the communities in Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands (Tozer, Turner et al. 2010).

Names of plants used in this document follow PlantNet Royal Botanic Gardens (Royal Botanic Gardens 2018) for recent taxonomic changes. Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in plant lists in appendices. The names of introduced species are denoted with an asterisk (\*).

For threatened species of plants, the names used in the OEH Threatened Species Website (Office of Environment & Heritage 2018) are also provided in the tabulated data in appendices where these differ from the names used by PlantNet database.

Names of vertebrate fauna follow the Australian Faunal Directory maintained by the Department of the Environment (Department of Environment and Energy 2018). Common names are used in the report for species of animal. Scientific names are included in species lists found in appendices.

## 3.4 DESKTOP ASSESSMENT

A desktop study was conducted to identify:

- the likely distribution of vegetation communities, based on previous mapping and aerial photograph interpretation, for targeted field verification
- a list of threatened species and populations of plants to consider during vegetation surveys and habitat assessment
- a list of threatened species and populations of animals and migratory animals to consider during field-based habitat assessment
- local landscape-scale features of potential significance to biodiversity; e.g. riparian zones and potential wildlife movement corridors
- evaluate baseline information and determine whether additional surveys, mapping and reporting is required to progress to a rezoning application.

The desktop study included analysis of the following information sources:

- topographic map and aerial photographs
- priority weeds in the Greater Sydney region (Department of Primary Industries 2018)
- previous vegetation mapping, ecological studies and other relevant studies of the study area:
  - *Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands* (Tozer, Turner et al. 2010).

In addition to the literature listed above database searches of threatened species, populations and communities were conducted in the locality and are summarised below in Table 3.2.

Table 3.2 Database searches

DATABASE	SEARCH DATE	AREA SEARCHES	REFERENCE
PlantNet Database	12/11/18	10 km radius centred on the study area	(Royal Botanic Gardens 2018)
OEH BioNet Atlas of NSW Wildlife	12/11/18	10 km x 10 km centred on the study area	(Office of Environment & Heritage 2018)
EPBC Protected Matters Search Tool	12/11/18	10 km x 10 km centred on the study area	(Department of the Environment and Energy 2018)
NSW Department of Primary Industries (Fishing and Aquaculture) threatened Aquatic Fauna Database	12/11/18	Relevant catchment (Sydney Metro)	(Department of Primary Industries 2018)

### 3.4.1 DESKTOP ANALYSIS OF VEGETATION

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

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## 3.5 FIELD SURVEY

A field survey was undertaken on the 12 November 2018. This survey sought primarily to assess the extent and condition of vegetation and fauna habitat, especially for threatened species and ecological communities. The vegetation inspection was used to identify variations in vegetation condition that were not apparent in existing vegetation mapping and refine vegetation community boundaries.

The field surveys undertaken are described in sections 3.5.1 to section 3.7.

### 3.5.1 FLORA SURVEY

The floristic diversity and possible presence of threatened species was assessed undertaking a random meander survey (Cropper 1993).

#### 3.5.1.1 FIELD VERIFICATION OF EXISTING VEGETATION

Vegetation within the study area and locality has been mapped at the regional scale in '*Native vegetation of the Southeast NSW: Revised Classification and Map for the Coast and Eastern Tablelands*' (Tozer, Turner et al. 2010).

Data on geology, dominant canopy species, native diversity, vegetation structure and condition was collected across the study area to validate and refine this existing vegetation classification to determine their associated PCT in accordance with the BioNet Vegetation Classification (Office of Environment and Heritage 2017).

#### 3.5.1.2 MAPPING OF VEGETATION ZONES

Field validation (ground-truthing) of the existing vegetation classifications undertaken by regional vegetation mapping and previous ecological surveys of the study area was completed to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. This was based on floristic sampling and vegetation integrity plots as described below.

Vegetation zones and conditions were identified and mapped following the Biodiversity Assessment Method (BAM) (Office of Environment & Heritage 2017). This was based on field verification of the PCT, class and formation as outlined in BioNet Vegetation Classification (Office for Environment & Heritage 2018).

#### 3.5.1.3 RANDOM MEANDER SURVEYS

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

### 3.5.2 FAUNA SURVEY

#### 3.5.2.1 FAUNA HABITAT ASSESSMENT

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

Fauna habitat characteristics assessed included:

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

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

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

#### 3.5.2.2 OPPORTUNISTIC RECORDING

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

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

- hollow-bearing trees
- aquatic habitat
- rock outcrops.

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## 3.6 LIKELIHOOD OF OCCURRENCE ASSESSMENT

The likelihood of threatened and migratory and threatened species populations occurring within the subject site was assessed against the criteria outlined in Table 3.3.

Species subject to likelihood of occurrence assessments were those identified during the desktop and field-based investigations and any additional species considered having the potential to occur in the professional opinion of contributors to this assessment.



Table 3.3 Likelihood of occurrence

LIKELIHOOD OF OCCURRENCE	CRITERIA
<b>Known</b>	The species was observed in the subject site either during the current survey or during another recent survey.
<b>High</b>	<p>A species has a high likelihood of occurrence if:</p> <ul style="list-style-type: none"> <li>— the subject site contains or forms part of a large area of high quality suitable habitat</li> <li>— important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the subject site</li> <li>— the species has been recorded recently in similar habitat in the locality</li> <li>— the subject site is likely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.</li> </ul>
<b>Moderate</b>	<p>A species has a moderate likelihood of occurrence if:</p> <ul style="list-style-type: none"> <li>— the subject site contains or forms part of a small area of high quality suitable habitat</li> <li>— the subject site contains or forms part of a large area of marginal habitat</li> <li>— important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the subject site</li> <li>— the subject site is unlikely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.</li> </ul>
<b>Low</b>	<p>A species has a low likelihood of occurrence if:</p> <ul style="list-style-type: none"> <li>— potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct)</li> <li>— the species is considered to be a rare vagrant, likely only to visit the subject site very rarely; e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).</li> </ul>
<b>None</b>	Potentially suitable habitat is absent from the subject site.

### 3.7 LIMITATIONS

Even where field surveys are undertaken, no sampling technique can totally eliminate the possibility that a species is present on a site. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present on site during surveys. Where surveys were conducted outside the optimal time for detecting a particular species, or field surveys were of limited scope, a precautionary approach was taken and it was assumed that the species was present if suitable habitat was observed. Similarly, for areas of vegetation that were not accessible for field verification, vegetation was presumed to be of the community shown in what was considered to be the most accurate available pre-existing vegetation mapping.

The conclusions in this report are based upon the limited data acquired from the site during environmental field surveys and desktop assessment and are, therefore, merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of species and the distribution of vegetation types. Also, it should be recognised that site conditions, including the presence of threatened species, can change with time.

# 4 EXISTING ENVIRONMENT

## 4.1 VEGETATION COMMUNITIES

### 4.1.1 HIGHLY DISTURBED AREAS WITH NO OR LIMITED NATIVE VEGETATION

All vegetation observed within the study area comprised of ornamental planted exotic and native garden specimens along with a small area of exotic perennial grasses that do not form part of any recognised native NSW PCT (Photo 4.1 to **Error! Reference source not found.**).



Photo 4.1 Planted *Casuarina glauca* (Swamp Oak), *Casuarina cunninghamiana* (River Oak) and *Allocasuarina littoralis* (Black She-oak) underneath powerlines



Photo 4.2 Planted *Tibouchina macrantha* (Lasiandra) on the northern side of Kingsgrove Avenue

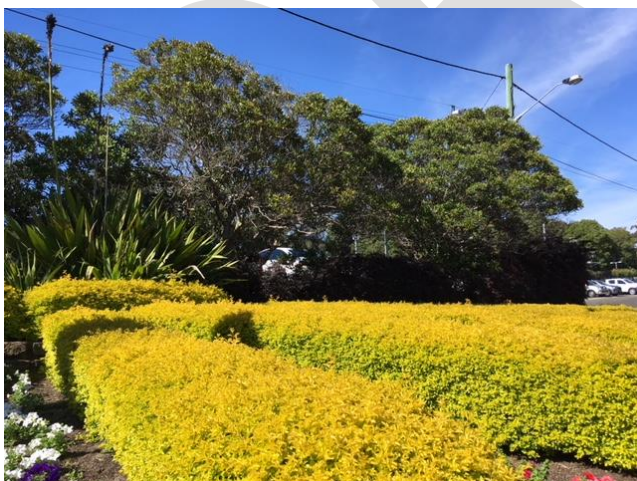


Photo 4.3 Planted ornamental garden on the corner of Bexley Road and Kingsgrove Avenue



Photo 4.4 Exotic perennial grasses to the east of Bexley Road and north of the rail line (proposed construction compound area)

Dominant semi-mature to mature trees observed fringing the Kingsgrove Avenue carpark include; *Casuarina glauca* (Swamp Oak), *Casuarina cunninghamiana* (River Oak) and *Allocasuarina littoralis* (Black She-oak), which occur on the southern side of the carpark and are currently pruned due to overhead power lines and *Tibouchina macrantha* (Lasiandra) (Photo 4.1). Planted ornamental garden specimens occurring on the corner of Bexley Road and Kingsgrove Avenue include *Abelia × grandiflora* 'Kaleidoscope' (Glossy Abelia), *Lomandra* sp. (Mat Rush) and *Petunia* sp, (Petunia) (Photo 4.2 & Photo 4.3).

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## 4.2 FAUNA HABITATS

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

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

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## 4.3 WEEDS

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

# 5 THREATENED BIODIVERSITY

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## 5.1 THREATENED ECOLOGICAL COMMUNITIES

No threatened ecological communities were identified within the study area. All vegetation observed within the study area comprised of ornamental planted exotic and native garden specimens that do not form part of any recognised native NSW PCT.

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## 5.2 THREATENED FLORA

No threatened flora were identified during site inspections. Background investigations identified 45 threatened flora species listed under the BC Act and/or EPBC Act that were considered to have the potential to occur within the locality of the study area (Appendix A). Following field surveys, it is considered that the study area is unlikely to provide habitat to threatened flora species.

No specific assessment of significance for any threatened flora species listed under either the BC Act or EPBC Act are considered warranted to assess the impacts of the Proposal.

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## 5.3 THREATENED FAUNA

No threatened fauna species were identified during site inspections. Background investigations identified 77 threatened fauna species listed under the BC Act and/or EPBC Act that have been previously recorded or have the potential to occur within the locality (Appendix B). The likelihood of these species occurring within the study area was determined based on field investigations and fauna habitat available. Based on available habitat and the potential impacts of the Proposal, it is considered unlikely that any threatened fauna have a moderate to high likelihood of occurrence or utilisation of the available habitat within the study area.

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## 5.4 MIGRATORY SPECIES

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

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

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



# 6 POTENTIAL IMPACTS

Potential impacts to biodiversity resulting from the construction and operation phases of the Proposal have been considered below.

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## 6.1 IMPACTS DURING CONSTRUCTIONS

### 6.1.1 DIRECT IMPACTS

Direct impacts to biodiversity as a result of the Proposal are considered negligible due to the existing disturbed nature of the available habitat and the nature of the construction works to be undertaken. Vegetation clearing would be minimal (removal of eight planted semi- mature She-oaks in the form of six *Casuarina glauca* (Swamp Oak), one *Casuarina cunninghamiana* (River Oak) and one *Allocasuarina littoralis* (Black She-oak) trees). No impacts to remnant native vegetation or high quality fauna habitat are predicted as a result of the Proposal.

Direct mortality or trauma to fauna is also expected to be minimal as habitat to be removed is of low quality (i.e. planted native trees and landscape gardens).

### 6.1.2 IMPACTS TO THREATENED FAUNA

No threatened fauna are likely to be significantly impacted by the Proposal. It is unlikely that any threatened fauna identified within the locality would have a moderate to higher likelihood to utilise the habitat within the study area, nor are any threatened fauna likely to be reliant on the habitat to be removed or impacted. The mitigation measures outlined below in Section 7 would ensure that any possible indirect impacts would be minimised.

### 6.1.3 REMOVAL OF VEGETATION

The removal/disturbance of six *Casuarina glauca* (Swamp Oak), one *Casuarina cunninghamiana* (River Oak) and one *Allocasuarina littoralis* (Black She-oak) trees in the form of a planted native vegetation and some associated landscape garden would be undertaken as part of the Proposal (refer to *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, November 2018). These trees are located within the existing rail corridor, were planted as part of station carpark landscaping and are not naturally occurring vegetation. The impact of this vegetation is unlikely to constitute important biodiversity value.

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

### 6.1.4 POTENTIAL ENVIRONMENTAL IMPACT OF NOISE, LIGHT AND VIBRATIONS ON WILDLIFE

Many animals detect and depend on sound to communicate, navigate, evade danger and find food, but human-made noise can alter the behaviour of animals or interfere with their normal functioning. In some cases it can harm their health, reproduction, survivorship, habitat use, distribution, abundance, or genetic composition (Forman *et al.* 2000). However, variation in ambient noise, such as from wind or other animals, is part of the natural environment and many animals display behavioural adaptations to this variation. For example, certain species of frogs avoid vocalising during loud calling by cicadas or other frogs and some species will time their calls during brief periods of silence (Schwartz & Henderson 1991).

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

### 6.1.5 WEEDS

The Proposal is unlikely to impact any Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region such that they would pose a risk to any areas of native vegetation. Outside the study area, thickets of *Lantana camara* (Lantana) were observed fringing Wolli Creek although the Proposal is unlikely to further exacerbate this infestation.

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## 6.2 IMPACTS DURING OPERATION

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

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# 7 AVOID, MINIMISE AND MITIGATE

Construction of the Proposal must be undertaken in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline*, TfNSW's *Fauna Management Guideline* and TfNSW's Biodiversity Offsets Calculator. Specifically, the following measures will be undertaken:

- all workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity
- disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees nominated to be removed in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, November 2018) would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below
- where the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed as a result of the project in accordance with the TfNSW's *Vegetation Offset Guide* (2016). In accordance with Section 5 of the guideline it is expected that around 32 trees would be required to meet this offset requirement
- Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, November 2018). Tree protection would be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and would include exclusion fencing of TPZs
- in the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible
- should the detailed design or onsite works determine the need to remove or trim any additional trees, which have not been identified in the REF, the Contractor would be required to complete TfNSW's Tree Removal Application Form and submit it to TfNSW for approval
- for new landscaping works, mulching and watering would be undertaken until plants are established. New plantings shall be maintained for a minimum period of twelve (12) months from the date of installation to ensure successful establishment. The maintenance regime shall include regular watering, replenishment of mulch, weed control, adjustment of any stakes or ties used for temporary support and monitoring of the general health and condition of the trees. Any of the trees that fail within the first 12 months shall be replaced with new tree stock of equivalent species. Replacement trees shall be maintained for a further 12 months from planting to ensure successful establishment.
- weed control measures, consistent with TfNSW's *Weed Management and Disposal Guideline*, would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the Proposal. This would include the management and disposal of weeds in accordance with the *Noxious Weeds Act 1993*.

## 8 CONCLUSION

This Biodiversity Assessment Report has been prepared to inform a Review Environmental Factors (REF) for the Bexley North Station Upgrade. The findings from desktop assessment and field investigations have identified minimal impacts to native vegetation and fauna habitat. Due to the activity occurring within an urban precinct the biodiversity value of the existing environment is low.

All vegetation observed within the study area comprised of ornamental planted exotic and native garden specimens that do not form part of any recognised native NSW PCT. There are no high-quality intact areas of native vegetation or any important fauna habitat features within the study area.

The Proposal would result in the removal of six planted *Casuarina glauca* (Swamp Oak), one *Casuarina cunninghamiana* (River Oak) and one *Allocasuarina littoralis* (Black She-oak) trees and a small area of landscape garden. The impact of this vegetation loss is unlikely to constitute an impact to important biodiversity value.

Threatened fauna species identified within the locality would likely intermittently utilise the planted vegetation as foraging habitat, however, the habitat is considered low in quality and unlikely to play an important role in the lifecycle of these species.

The Proposal would not involve any impact to native vegetation, threatened terrestrial or aquatic species, endangered ecological communities or their habitat. The proposed activity is deemed unlikely to significantly affect threatened species in accordance with Section 7.3 of the BC Act. Given this, a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) is not required to accompany the REF. The Proposal is also unlikely to significantly affect Matters of National Environmental Significance and as such a referral of this activity is not deemed required under the EPBC Act.

The impacts to native biodiversity are predicted to be negligible and any residual or indirect impacts will be mitigated by undertaking works in accordance with TfNSW's Vegetation Management (Protection and Removal) Guideline, TfNSW's Vegetation Offset Guide and TfNSW's Fauna Management Guideline.

The mitigation measures outlined in Section 7 would ensure any potential impact to native biodiversity would have no significant impact to biodiversity.



# 9 LIMITATIONS

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## 9.1 SCOPE OF SERVICES

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

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## 9.2 RELIANCE ON DATA

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

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## 9.3 ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data provided for the preparation of the report. Within the limitations imposed by the scope of services, the surveys and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

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## 9.4 REPORT FOR BENEFIT OF CLIENT

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

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# APPENDIX A

## THREATENED FLORA LIKELIHOOD OF OCCURRENCE





## A.1 THREATENED FLORA LIKELIHOOD OF OCCURRENCE WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	This species occurs in heath or dry sclerophyll forest on sandy soils and is generally associated with overstorey species such as Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksias and Narrow-leaved Apple.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Acacia bynoeana</i> within the study area is considered unlikely.
<i>Acacia prominens</i>	Endangered population - Gosford Wattle, Hurstville and Kogarah Local Government Areas	E	-	Grows in open situations on clay or sandy soils. The population within Hurstville and Kogarah is known from a few sites along the railway line at Penshurst, at Carss Bush Park and Oatley Park.	BioNet	Low  The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Acacia prominens</i> within the study area is considered unlikely.
<i>Acacia pubescens</i>	Downy Wattle	V	V	Restricted to the Sydney Region from Bilpin to the Georges River and also at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically it occurs at the intergrade between shales and sandstones in gravelly soils often with ironstones.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Acacia pubescens</i> within the study area is considered unlikely.

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SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Sunshine Wattle	E	E	This species is associated with coastal scrub and dry sclerophyll woodland on sandy soils.	BioNet, PlantNET	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Acacia terminalis</i> subsp. <i>terminalis</i> within the study area is considered unlikely.
<i>Allocasuarina glareicola</i>	Allocasuarina glareicola	E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows on lateritic soil in open forest.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Allocasuarina glareicola</i> within the study area is considered unlikely.
<i>Asterolasia elegans</i>	Asterolasia elegans	E	E	Occurs on Hawkesbury sandstone where it is found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Asterolasia elegans</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	E	V	Occurs south of Swansea where it grows on clay loam or sandy soils. Prefers low open forest with a heathy or sometimes grassy understorey. Within NSW, currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Previously known also from Sydney and South Coast areas.	BioNet	Low Two historic records of this species occur within the locality. These records exceed 100 years in date and are located within highly urbanised areas of Marrickville South and Tempe. The local occurrence of this species is considered to be extinct. In addition, the study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Caladenia tessellata</i> within the study area is considered unlikely.
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	This species is associated with dry sclerophyll forest on the coast and adjacent ranges.	BioNet, PlantNET	Low There are 3 known records of this species within the locality (OEH 2018). These records occur to the east of the study area at Phillip Bay and La Perouse. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Callistemon linearifolius</i> within the study area is considered unlikely.
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Occurs south from the Gibraltar Range, chiefly in coastal districts but also extends on to tablelands. Grows in swamp-heath and drier forest on sandy soils on granite & sandstone. Occurs in small, localised colonies most often on the flat plains close to the coast but also known from some mountainous areas growing in moist depressions and swampy habitats.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Cryptostylis hunteriana</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Deyeuxia appressa</i>	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.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Deyeuxia appressa</i> within the study area is considered unlikely.
<i>Genoplesium baueri</i>	Yellow Gnat-orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. The species has been recorded from locations between Ulladulla and Port Stephens (OEH 2018).	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Genoplesium baueri</i> within the study area is considered unlikely.
<i>Maundia triglochinoides</i>	Maundia triglochinoides	V	-	Maundia triglochinoides is currently known to occur north from the Wyong region on the Central Coast with most populations occurring within the North Coast Bioregion. Historic records occur from the Sydney region although the species is generally considered extinct within this area. The Sydney records were all from the early 1900's with the localities recorded as Kogarah Swamp, Rockdale and Sans Souci (Atlas of Living Australia 2018).	BioNet	Low  Based on the lack of any records of this species in the last 100 years within the locality and given the highly disturbed nature of the study area, it is considered the likelihood of occurrence of this species is low.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Occurs as disjunct populations in coastal New South Wales from Jervis Bay to Port Macquarie, with the main concentration of records is in the Gosford/Wyong area. Grows in damp places, often near streams, or low-lying areas on alluvial soils of low slopes or sheltered aspects.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Melaleuca biconvexa</i> within the study area is considered unlikely.



SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone.	BioNet	Low  The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Melaleuca deanei</i> within the study area is considered unlikely.
<i>Pelargonium sp. Striatellum</i>	Omeo Stork's-bill	E	E	Known from only 4 locations in NSW, with three on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. The only other known population is at Lake Omeo, Victoria. It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities. It occurs on sandy soils or gravelly soils or amongst rocks.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Pelargonium sp. Striatellum</i> within the study area is considered unlikely.
<i>Persoonia hirsuta</i>	Hairy Geebung	E	E	The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. It has a large area of occurrence, but occurs in small populations. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone or very rarely on shale. Often occurs in areas with clay influence, in the ecotone between shale and sandstone.	BioNet, EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Persoonia hirsuta</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Pimelea curviflora</i> var. <i>curviflora</i>	-	V	V	Confined to coastal areas around Sydney where it grows on sandstone and laterite soils. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville, but its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Usually occurs in woodland in the transition between shale and sandstone, often on Lucas Heights soil landscape.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Pimelea curviflora</i> var. <i>curviflora</i> within the study area is considered unlikely.
<i>Pimelea spicata</i>	Spiked Rice-flower	E	E	This species occurs in two disjunct areas: in coastal districts from Lansdowne to Shellharbour, and in Cumberland Plain Woodland inland to Penrith. In western Sydney it grows on Wianamatta Shales in Greybox - Ironbark Woodland with <i>Bursaria spinosa</i> and <i>Themeda australis</i> . In the Illawarra, it occurs on well structured clay soils in grassland or open woodland.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Pimelea spicata</i> within the study area is considered unlikely.
<i>Pomaderris prunifolia</i>	P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	E	-	Known from only three sites within the listed local government areas, at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere it occurs along a road reserve near a creek, among grass species on sandstone. At Rookwood Cemetery it occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils.	BioNet	Low  The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Pomaderris prunifolia</i> within the study area is considered unlikely.
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E	E	Known now only from Freemans Reach to Picton district. Grows in Sydney Sandstone Gully Forest in shallow or skeletal soils over sandstone shelves, often near streams.	EPBC Act Protected matters search	Low  This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Pterostylis saxicola</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	E	Occurs between Bulahdelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central Coast, Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	BioNet, EPBC Act Protected matters search	Low The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Syzygium paniculatum</i> within the study area is considered unlikely.
<i>Tetradlea juncea</i>	Black-eyed Susan	V	V	Historically recorded in the Sydney area although now confined to the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock.	BioNet	Low Based on the lack of any records of this species in the last 100 years within the locality and given the highly disturbed nature of the study area, it is considered the likelihood of occurrence of this species is low.
<i>Thelymitra kangaloonica</i>	Kangaloon Sun Orchid	CE	CE	Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. It is found in swamps in sedgeland over grey silty grey loam soils. It is thought to be a short-lived perennial, flowering in late October and early November.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Thelymitra kangaloonica</i> within the study area is considered unlikely.
<i>Thesium australe</i>	Austral Toadflax	V	V	Grows in grassland or woodland often in damp sites. It is a semi-parasitic herb and hosts are likely to be <i>Themeda triandra</i> (Syn. <i>Themeda australis</i> and <i>Poa</i> spp.	EPBC Act Protected matters search	Low This species has not been recorded within the locality. The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Thesium australe</i> within the study area is considered unlikely.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	NATURE OF RECORD	LIKELIHOOD OF OCCURRENCE
<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V	-	The occurrence of this species within the broader Sydney region is mostly restricted discrete populations in the localities of Parramatta River at Ermington, Clovelly, Voyager Point and the Royal National Park	BioNet	Low  The study area does not contain associated habitat attributes such as vegetation formation, floristic assemblage or geological substrate. The occurrence of <i>Wilsonia backhousei</i> within the study area is considered unlikely.

(1) Listed as Vulnerable (V), Endangered (E1), Endangered populations (E2) or Critically Endangered (CE) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

(2) Listed as Vulnerable (V), Endangered (E) or Critically Endangered (CE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

(3) Habitat data derived from BioNet (Office of Environment & Heritage 2018).

# APPENDIX B

THREATENED FAUNA LIKELIHOOD OF  
OCCURRENCE





## B.1 THREATENED FAUNA LIKELIHOOD OF OCCURRENCE WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<b>Amphibians</b>						
<i>Crinia tinnula</i>	Wallum Froglet	V		Occurs along coast from south-eastern Queensland to Sydney. Mostly associated with swamps, dams and flooded roadside ditches, usually in heathland, where it is confined to acid, paperbark swamps and sedge swamps of the 'wallum' country. Males call any time of year. Breed in late winter.	Bionet	Low – no suitable habitat identified within study area
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	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 300m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Breeding habitat of this species is generally soaks or pools within first or second order streams. Species is dependent on hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin.	EPBC	Low – no suitable habitat identified within study area
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	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. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes ( <i>Typha</i> spp.) or spikerushes ( <i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow ( <i>Gambusia holbrooki</i> ), have a grassy area nearby and diurnal sheltering sites available.	Bionet, EPBC	Low – no suitable habitat identified within study area

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SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog, Heath Frog	V	V	Has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. The majority of records are from within the Sydney Basin Bioregion with only scattered records south to the Victorian border and this species has not been recorded in southern NSW within the last decade. Records are isolated and tend to be at high altitude. This species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground.	EPBC	Low – no suitable habitat identified within study area
<i>Litoria raniformis</i>	Southern Bell Frog	E1	V	In the past, the Growling Grass Frog was distributed across a large area of south-east Australia, including Tasmania, at altitudes of up to 1300 m. Its range has declined over time with the most pronounced decline evident in NSW. The species has disappeared from a number of sites along the Murrumbidgee River and there are no recent records from the Monaro district near the Victorian border. The Southern Bell Frog is usually found amongst emergent vegetation such as Typha, Phragmites and Eleocharis within or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds, and farm dams. It also occurs in irrigation channels and crops, lignum shrublands, black box and river red gum woodlands and at the periphery of rivers. Apart from breeding and foraging habitat, refuge areas for this species may include soil cracks, fallen timber, debris and dense vegetation on low, frequently inundated floodplains. Vegetation types in which this species occurs include open grassland (including crops and pastures), open forest, and ephemeral and permanent non-saline marshes and swamps.	EPBC	Low – no suitable habitat identified within study area
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only Mixophyes species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species. 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.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<b>Birds</b>						
<i>Actitis hypoleucos</i>	Common Sandpiper		M	The Common Sandpiper frequents a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. It is mostly encountered along muddy margins or rocky shores and rarely on mudflats. It has been recorded in estuaries and deltas of streams, banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks.	EPBC	Low – no suitable habitat identified within study area
<i>Anthochaera phrygia</i> (syn. <i>Xanthomyza phrygia</i> )	Regent Honeyeater	CE	EM	Inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. It inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. It feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Apus pacificus</i>	Fork-tailed Swift		M	Breeds in the northern hemisphere, wintering south to Australia. It is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground. It mostly occurs over inland plains but sometimes above foothills or in coastal areas over cliffs, beaches, islands and well out to sea. It also occurs over towns and cities. It mostly occurs over dry and/or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh, grassland, spinifex sandplains, farmland and sand-dunes. It sometimes occurs above forests. It probably roosts aerially, but has occasionally been observed to land.	EPBC	Low – although species may use aerial spaces above subject site is unlikely to occur within terrestrial vegetation within the site.



SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Arenaria interpres</i>	Ruddy Turnstone		M	Occurs at beaches and coasts with exposed rock, stony or shell beaches, mudflats, exposed reefs and wave platforms.	EPBC	Low – no suitable habitat identified within study area
<i>Artamus cyanopterus cyanopterus</i>	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.	Bionet	Low – marginal habitat within the study area.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes ( <i>Typha</i> spp.) and spikerushes ( <i>Eleocharis</i> spp.). Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds.	EPBC	Low – no suitable habitat identified within study area
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	V		Generally found in western New South Wales in the Murray Basin. Occurs in arid and semi-arid zone woodlands dominated by Mulga, mallee, box eucalypts and Callitris pine where it feeds on seeds, roots and fruit. The main requirement of this species is trees with suitable nesting hollows and fresh surface water.	Bionet	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Calidris (Crocethia) alba</i>	Sanderling	V	M	The Sanderling occurs in coastal areas around Australia. Inland records have occurred in most states of singles or small groups, birds probably on migration. In Australia, the species is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops. Less often the species occurs on more sheltered sandy shorelines of estuaries, inlets and harbours. Rarely, they are recorded in near-coastal wetlands, such as lagoons, hypersaline lakes, saltponds and samphire flats. There are rare inland records from sandy shores of ephemeral brackish lakes and brackish river-pools.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper		M	Occurs in a variety of habitats: tidal mudflat, mangrove swamps, saltmarshes, shallow fresh, brackish, salt inland swamps and lakes; flooded and irrigated paddocks, sewage farms and commercial saltfields.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris canutus</i>	Red Knot		EM	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats 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. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris ferruginea</i>	Curlew Sandpiper	E1	M	Occurs in inter-tidal mudflats of estuaries, lagoons, mangrove channels and also around lakes, dams, floodwaters and flooded saltbush surrounding inland lakes.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Calidris melanotos</i>	Pectoral Sandpiper		M	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species frequents coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It is usually found in coastal or near coastal habitat but occasionally further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. It has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	EPBC	Low – no suitable habitat identified within study area

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<i>Calidris ruficollis</i>	Red-necked Stint		M	Mostly found in coastal areas, including sheltered inlets, bays lagoons and estuaries. They also occur in shallow wetlands near the coast or inland, including lakes, waterholes and dams. They forage in mudflats, shallow water, sandy open beaches, flooded paddocks and in samphire feeding along the edges. The species roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle. Occasionally they roost on exposed reefs or shoals and amongst seaweed, mud and cow-pats. During high tides they may also use sand dunes and claypans.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris subminuta</i>	Long-toed Stint		M	Prefers terrestrial wetlands of fresh or brackish waters, including muddy shorelines and inundated vegetated areas. A regular but sparse summer visitor more common in the west than in the east.	EPBC	Low – no suitable habitat identified within study area
<i>Calidris tenuirostris</i>	Great Knot	V	CEM	Generally a coastal species found on tidal mudflats and sandy ocean shores. A migratory species visiting Australian waters between September and March.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		The Gang-gang Cockatoo is distributed from southern Victoria through south and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum ( <i>Eucalyptus pauciflora</i> ) woodland and occasionally in temperate rainforests. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.	Bionet	Low – marginal foraging habitat in study area. Irregular occurrences whilst foraging within greater locality.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Charadrius bicinctus</i>	Double-banded Plover		M	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. It is sometimes associated with coastal lagoons, inland saltlakes, exposed seagrass beds, exposed reefs and rock platforms and coastal sand dunes.	EPBC	Low – no suitable habitat identified within study area
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	VM	Entirely coastal in NSW foraging on intertidal sand and mudflats in estuaries, and roosting during high tide on sand beaches or rocky shores. A migratory species it is found in New South Wales generally during the summer months.	EPBC	Low – no suitable habitat identified within study area
<i>Charadrius mongolus</i>	Lesser Sand Plover	V	EM	Migratory bird that migrates from the northern hemisphere to coastal areas of northern and east coast of Australia. The species is almost strictly coastal during the non-breeding season, preferring sandy beaches, mudflats of coastal bays and estuaries, sand-flats and dunes near the coast, occasionally frequenting mangrove mudflats (IUCN Redlist entry).	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Charadrius veredus</i>	Oriental Plover		M	Oriental Plovers are found in coastal habitats, including estuarine mudflats and sandbanks, on sandy or rocky ocean beaches, nearby reefs, or near-coastal grasslands. They also disperse further inland inhabiting flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps. Oriental Plovers may move to lightly wooded grasslands in wet season and sometimes roost on soft wet mud or in shallow waters of ocean or mudflats, and also occasionally in dry, open habitats, such as saltmarsh or paddocks.	EPBC	Low – no suitable habitat identified within study area
<i>Cuculus opatus</i> (syn. <i>Cuculus saturatus</i> )	Oriental Cuckoo, Himalayan Cuckoo		M	A non-breeding migrant to Australia, it often inhabits rainforest, vine thickets, wet sclerophyll forest and open woodland and sometimes occurs in mangroves, wooded swamps and as vagrants in gardens. The population trend appears to be stable.	EPBC	Low – no suitable habitat identified within study area

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<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	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. Age of habitat since fires (fire-age) is of paramount importance to this species.	EPBC	Low – no suitable habitat identified within study area
<i>Gallinago hardwickii</i>	Latham's Snipe		M	Occurs in freshwater or brackish wetlands generally near protective vegetation cover. This species feeds on small invertebrates, seeds and vegetation. It migrates to the northern hemisphere to breed.	EPBC	Low – no suitable habitat identified within study area
<i>Gallinago megala</i>	Swinhoe's Snipe		M	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, drier cultivated areas (including crops of rapeseed and wheat) and market gardens. Habitat specific to Australia includes the dense clumps of grass and rushes round the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. They are also found in drying claypans and inundated plains pitted with crab holes.	EPBC	Low – no suitable habitat identified within study area
<i>Gallinago stenura</i>	Pintail Snipe		M	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. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands.	EPBC	Low – no suitable habitat identified within study area

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<i>Grantiella picta</i>	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/ Weeping Myall ( <i>Acacia pendula</i> ), Brigalow ( <i>A. harpophylla</i> ) 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 <i>Amyema</i> .	EPBC	Low – no suitable habitat identified within study area
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V		The Sooty Oystercatcher is found on rocky headlands, rock shelves, exposed reefs with rock pools, beaches and muddy estuaries {Marchant, 1993 #534}. The species forages on exposed intertidal rocky shorelines at low tide. It breeds almost exclusively on offshore islands, and occasionally on isolated promontories during spring and summer. They nest on the ground in amongst rocks, seaweed, shells and pebbles.	Bionet	Low – no suitable habitat identified within study area
<i>Haematopus longirostris</i>	Australian Pied Oystercatcher	E1		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. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas.	Bionet	Low – no suitable habitat identified within study area
<i>Hieraetus morphnoides</i>	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. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	Bionet	Low – marginal habitat within study area, may irregularly occur flying over the study area whilst foraging in greater locality.

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	Widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. It is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. In coastal areas, they are sometimes seen flying over sandy beaches or mudflats and often around coastal cliffs and other areas with prominent updraughts, such as ridges and sand-dunes.	EPBC	Low - although species may use aerial spaces above subject site is unlikely to occur within terrestrial vegetation within the study area.
<i>Ixobrychus flavicollis</i>	Black Bittern	V		The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds.	Bionet	Low – no suitable habitat identified within study area

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<i>Lathamus discolor</i>	Swift Parrot	E1	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. 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 <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Inland Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> .	Bionet, EPBC	Low – marginal habitat within study area. Irregular/sporadic occurrences during seasonal movements may occur.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V	M	A migratory species that breeds in the northern hemisphere between June and August. Individuals feed both on exposed mudflats and while wading in water.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Limosa lapponica</i>	Bar-tailed Godwit		M	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria, including the offshore islands. Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas.	EPBC	Low – no suitable habitat identified within study area
<i>Limosa limosa</i>	Black-tailed Godwit	V	M	A coastal species found on tidal mudflats, swamps, shallow river margins and sewage farms. Also found inland on larger shallow fresh or brackish waters. A migratory species visiting Australia between September and May.	Bionet	Low – no suitable habitat identified within study area
<i>Monarcha melanopsis</i>	Black-faced Monarch		M	Occurs in rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest and in more open woodland when migrating.	EPBC	Low – marginal habitat available in study area.
<i>Monarcha trivirgatus</i>	Spectacled Monarch		M	Occurs in the understorey of mountain/lowland rainforests, thickly wooded gullies and waterside vegetation. Migrates to NE NSW in summer to breed.	EPBC	Low – no suitable habitat identified within study area



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<i>Motacilla flava</i>	Yellow Wagtail		M	This species occurs in a range of habitats including estuarine habitats such as sand dunes, mangrove forests and coastal saltmarshes. This species also occurs in open grassy areas including disturbed sites such as sports grounds and has been recorded on the edges of wetlands, swamps, lakes and farm dams. This species migrates from Asia to Australia in spring-summer. It has been recorded in the estuarine areas of the Hunter River in Newcastle NSW and in QLD and the north of NT and WA.	EPBC	Low – no suitable habitat identified within study area
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		M	Widespread in eastern Australia. In Queensland, it is widespread but scattered in the east. In NSW, they are widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. In Victoria, the species is widespread in the south and east, in the area south of a line joining Numurkah, Maldon, the northern Grampians, Balmoral and Nelson. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests, often occurring in gullies. They also occur in eucalypt woodlands with open understorey and grass ground cover, and are generally absent from rainforest. In south-eastern Australia, they occur at elevations of up to 1400 m above sea level, and in the ACT, they occur mainly between 800 m above sea level and the treeline.	EPBC	Low – no suitable habitat identified within study area
<i>Neophema pulchella</i>	Turquoise Parrot	V		The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	Bionet	Low – no suitable habitat identified within study area

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<i>Ninox strenua</i>	Powerful Owl	V		The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing {Debus, 1994 #271}. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations. It inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest {Soderquist, 2007 #1819}. It 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. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider {Department of Environment and Conservation, 2005 #530}.	Bionet	Low – no suitable habitat identified within study area
<i>Numenius madagascariensis</i>	Eastern Curlew		CEM	Inhabits coastal estuaries, mangroves, mud flats and sand pits. It is a migratory shorebird which generally inhabits sea and lake shore mud flats, deltas and similar areas, where it forages for crabs and other crustaceans, clam worms and other annelids, molluscs, insects and other invertebrates. Its migration route ranges from its wintering grounds in Australia to its breeding grounds in northern China, Korea and Russia.	EPBC	Low – no suitable habitat identified within study area
<i>Numenius minutus</i>	Little Curlew		M	On passage the species shows a preference for foraging and resting in swampy meadows near lakes and along river valleys. It overwinters on dry inland grassland, bare cultivation, dry mudflats and coastal plains of black soil with scattered shallow pools of freshwater, swamps, lakes or flooded ground. It shows a preference for short grass swards of less than 20 cm tall, and occasionally occurs in dry saltmarshes, coastal swamps, mudflats or sandflats in estuaries, or on the beaches of sheltered coasts {BirdLife International, 2009 #3757}.	EPBC	Low – no suitable habitat identified within study area

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<i>Numenius phaeopus</i>	Whimbrel		M	Migrates to Taiwan, Philippines, PNG, and a race breeding in NE Siberia is found on the north and south-eastern coastlines of Australia. Juveniles arrive to Australia from spring to early summer. Usually only juveniles remain in Australia but very occasionally adults in breeding plumage may be seen in Australian winters {Pizzey, 2007 #24}.	EPBC	Low – no suitable habitat identified within study area
<i>Pandion cristatus</i> (syn. <i>P. haliaetus</i> )	Eastern Osprey	V	M	Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	EPBC	Low – no suitable habitat identified within study area
<i>Petroica phoenicea</i>	Flame Robin	V		In NSW the Flame Robin breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other shrublands in coastal areas. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. The Flame Robin forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other woody debris. The robin builds an open cup nest of plant fibres and cobweb, which is often near the ground in a sheltered niche, ledge or shallow cavity in a tree, stump or bank {Office of Environment & Heritage, 2015 #7292} {Higgins, 2002 #649}.	Bionet	Low – no suitable habitat identified within study area
<i>Pluvialis fulva</i>	Pacific Golden Plover		M	Prefers sandy, muddy or rocky shores, estuaries and lagoons, reefs, saltmarsh, and or short grass in paddocks and crops. The species is usually coastal, including offshore islands; rarely far inland. Often observed on beaches and mudflats, sandflats and occasionally rock shelves, or where these substrates intermingle; harbours, estuaries and lagoons.	EPBC	Low – no suitable habitat identified within study area

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<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V		The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. 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. Part of the population is migratory or nomadic.	Bionet	Low – no suitable habitat identified within study area
<i>Rhipidura rufifrons</i>	Rufous Fantail		M	Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens. When migrating they may also be recorded on farms, streets and buildings. Migrates to SE Australia in October-April to breed, mostly in or on the coastal side of the Great Dividing Range {Pizzey, 2013 #3525}.	EPBC	Low – no suitable habitat identified within study area
<i>Rostratula australis</i> ( <i>syn. R. benghalensis</i> )	Australian Painted Snipe (Painted Snipe)	E1	VM	The Australian Painted Snipe is restricted to Australia. 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. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. 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 {Department of Environment and Heritage, 2003 #3425}.	EPBC	Low – no suitable habitat identified within study area

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<i>Stagonopleura guttata</i>	Diamond Firetail	V		Distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. In NSW, the species occurs predominantly west of the Great Dividing Range, although populations are known from drier coastal areas {Blakers, 1984 #376} {Schodde, 1999 #3629}. Occurs in a range of eucalypt dominated communities with a grassy understorey including woodland, forest and mallee. Most populations occur on the inland slopes of the dividing range {Garnett, 2000 #21}. Firetails nest in trees and bushes, and forage on the ground, largely for grass seeds and other plant material, but also for insects {Blakers, 1984 #376} {Read, 1994 #3632}.	Bionet	Low – no suitable habitat identified within study area
<i>Sternula albifrons</i>	Little Tern	E1		Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets. They nest on sand-spits, sandbanks, ridges or islets in these habitats or gently sloping sandy ocean beaches and occasionally in sand-dunes {Garnett, 2000 #21}.	Bionet	Low – no suitable habitat identified within study area
<i>Tringa brevipes</i> (syn. <i>Heteroscelus brevipes</i> )	Grey-tailed Tattler		M	It is often found on sheltered coasts with reefs, rock platforms or with intertidal mudflats. It is also found at intertidal rocky, coral or stony reefs, platforms and islets that are exposed at low tide. It has also been found in embayments, estuaries and coastal lagoons, especially fringed with mangroves. It is rarely seen on open beaches and occasionally found around near-coastal wetlands, such as lagoons, lakes and ponds in sewage farms and saltworks. Inland records for the species are rare {Higgins, 1996 #648}. The species forages in shallow water, hard intertidal substrates, rock pools, intertidal mudflats, mangroves, banks of seaweed and among rocks and coral rubble, over which water may surge. The species roosts in mangroves, dense stands of shrubs, snags, rocks, beaches, reefs, artificial structures (sea walls, oyster racks), occasionally in near-coastal saltworks and sewage ponds and rarely on sandy beaches or sand banks {Higgins, 1996 #648} {Rogers, 1999 #3758}.	EPBC	Low – no suitable habitat identified within study area
<i>Tringa incana</i> (syn. <i>Heteroscelus incanus</i> )	Wandering Tattler		CEM	Generally found on rocky coasts with reefs and platforms, points, spits, piers, offshore islands and shingle beaches or beds. Occasionally seen on coral reefs or beaches, and tends to avoid mudflats Foraging habitat is among rocks or shingle, or in shallow pools at edges of reefs or beaches, mainly along the tideline. Wandering Tattlers have been recorded roosting or perching on top of boulders surrounded by or close to water {Higgins, 1996 #648}.	EPBC	Low – no suitable habitat identified within study area

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<i>Tringa nebularia</i>	Common Greenshank		M	Occurs in a range of inland and coastal environments. Inland, it occurs in both permanent and temporary wetlands, billabongs, swamps, lakes floodplains, sewage farms, saltworks ponds, flooded irrigated crops. On the coast, it occurs in sheltered estuaries and bays with extensive mudflats, mangrove swamps, muddy shallows of harbours and lagoons, occasionally rocky tidal ledges. It generally prefers wet and flooded mud and clay rather than sand.	EPBC	Low – no suitable habitat identified within study area
<i>Tringa stagnatilis</i>	Marsh Sandpiper		M	Occurs in coastal and inland wetlands (salt or fresh water), estuarine and mangrove mudflats, beaches, shallow or swamps, lakes, billabongs, temporary floodwaters, sewage farms and saltworks ponds.	EPBC	Low – no suitable habitat identified within study area
<i>Tyto novaehollandiae novaehollandiae</i>	Masked Owl	V		Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares.	Bionet	Low – no suitable habitat identified within study area
<i>Xenus cinereus</i>	Terek Sandpiper	V	M	In Australia widespread and common along north and east coasts than along south coastlines. It inhabits coastal areas, mostly saline intertidal mudflats in sheltered estuaries, embayments, harbours and lagoons; on islets, mudbanks or sandbanks and spits; often around mangroves.	Bionet, EPBC	Low – no suitable habitat identified within study area
<b>Fish</b>						
<i>Epinephelus daemeli</i>	Black Cod	V	V	Adult black cod are usually found in caves, gutters and beneath bomboras on rocky reefs. They are territorial and often occupy a particular cave for life. Small juveniles are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries. Black cod are opportunistic carnivores, eating mainly other fish and crustaceans. They can change from one colour pattern to another in just a few seconds. They are usually black in estuaries and banded around clear water reefs. Black cod are apparently slow growing. Smaller fish are mostly females, but they generally change sex to become males at around 100-110 cm in length.	EPBC	Low – no suitable habitat identified within study area



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<i>Macquaria australasica</i>	Macquarie Perch		E	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury/Nepean and Shoalhaven catchments. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water).	EPBC	Low – no suitable habitat identified within study area
<i>Prototroctes maraena</i>	Australian Grayling		V	Occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range, from Sydney, southwards to the Otway Ranges of Victoria and in Tasmania. The species is found in fresh and brackish waters of coastal lagoons, from Shoalhaven River in NSW to Ewan Ponds in South Australia. The Australian Grayling is diadromous, spending part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal seas. Adults (including pre spawning and spawning adults) inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones such as the Tambo River, which is also known to have granite outcrops. The species has also been associated with clear, gravel-bottomed habitats in the Mitchell and Wonnangatta Rivers (Victoria) and in a muddy-bottomed, heavily silted habitat in the Tarwin River (Victoria). The species has been found over 100 km upstream from the sea.	EPBC	Low – no suitable habitat identified within study area
<b>Invertebrates</b>						

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<i>Pommerhelix duralensis</i>	Dural Land Snail	E1	E	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species is definitely found within the Local Government Areas of The Hills Shire, Hawkesbury Shire and Hornsby Shire. Records from the Blue Mountains City, Penrith City and Parramatta City may represent this species. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris. Migration and dispersal is limited, with overnight straight-line distances of under 1 metre identified in the literature and studies. The main food sources are hyphae and fruiting bodies of native fungi. It is possible other detritus may be consumed.	EPBC	Low – no suitable habitat identified within study area
<b>Mammals</b>						
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin ( <i>Petrochelidon ariel</i> ), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	EPBC	Low – no suitable habitat identified within study area

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<i>Dasyurus maculatus maculatus</i>	Spotted-Tailed Quoll	V	E	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines.	EPBC	Low – no suitable habitat identified within study area. Study highly fragmented and isolated from extensive remnant patches.
<i>Isodon obesulus</i>	Southern Brown Bandicoot	E1	E	The Southern Brown Bandicoot has a patchy distribution. It is found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River, southern coastal Victoria and the Grampian Ranges, south-eastern South Australia, south-west Western Australia and the northern tip of Queensland. They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares.	EPBC	Low – no suitable habitat identified within study area
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent-wing Bat	V		Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Populations disperse within about 300 km range of maternity caves. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Bionet	
<i>Myotis macropus</i>	Southern Myotis, Large-footed Myotis	V		The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Bionet	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Perameles nasuta</i>	Long-nosed Bandicoot	E2		Populations on North Head (Manly) and in inner western Sydney listed as Endangered. Occurs in a range of habitats from rainforest through wet and dry woodland areas with little ground cover. 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.	Bionet	Low – outside the defined population boundary of the listed population.
<i>Petauroides volans</i>	Greater Glider		V	The Greater Glider has a restricted distribution in eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevated range from sea level to 1200m above sea level. The species is largely restricted to eucalypt forests and woodlands, feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. It is found in abundance in montane eucalypt forest with relatively old trees and an abundance of hollows. It also favours forests with a diversity of eucalypts to cater for seasonal variation in food abundance {McKay, 2008 #2902}, {Comport, 1996 #2901}.	EPBC	Low – no suitable habitat identified within study area
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. However the distribution of the species across its original range has declined significantly in the west and south and has become more fragmented. In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. 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. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night. Highly territorial and have strong site fidelity with an average home range size of about 15 ha.	EPBC	Low – no suitable habitat identified within study area

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<i>Phascolarctos cinereus</i>	Koala	V	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It was briefly historically abundant in the 1890s in the Bega District on the south coast of NSW, although not elsewhere, but it now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. 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. Some preferred species include Forest Red Gum, Grey Gum. In coastal areas, Tallowwood and Swamp Mahogany are important food species, while in inland areas White Box, Bimble Box and River Red Gum are favoured. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Bionet, EPBC	Low – no suitable habitat identified within study area
<i>Pseudomys novaehollandiae</i>	New Holland Mouse		V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Genetic evidence indicates that the New Holland Mouse once formed a single continuous population on mainland Australia and the distribution of recent subfossils further suggest that the species has undergone a large range contraction since European settlement. Total population size of mature individuals is now estimated to be less than 10,000 individuals although, given the number of sites from which the species is known to have disappeared between 1999 and 2009, it is likely that the species' distribution is actually smaller than current estimates. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	EPBC	Low – no suitable habitat identified within study area

SCIENTIFIC NAME	COMMON NAME	BC ACT STATUS <sup>1</sup>	EPBC ACT STATUS <sup>2</sup>	HABITAT <sup>3</sup>	DATA SOURCE	LIKELIHOOD OF OCCURRENCE
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Grey-headed Flying-foxes are generally found within 200km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. 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 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Can travel up to 50km from the camp to forage; commuting distances are more often <20km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.	Bionet, EPBC	Low – marginal habitat within the study area. May occur as a fly-over or irregularly whilst foraging in greater locality.
<b>Reptiles</b>						
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1	V	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250km of Sydney. 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 crevices or hollows in large trees within 500m of escarpments in summer.	EPBC	Low – no suitable habitat identified within study area

(1) Listed as Vulnerable (V), Endangered (E1), Endangered populations (E2) or Critically Endangered (CE) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

(2) Listed as Vulnerable (V), Endangered (E) or Critically Endangered (CE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

(3) Habitat data derived from BioNet (Office of Environment & Heritage 2018).

Note: due to no marine habitat present within or adjacent to the study area, marine species were not included within the likelihood of occurrence.