St Bartholomew's Cemetery Expansion

Ecological Report for Planning Proposal (Rezoning)

Prepared for
Blacktown City Council

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Abbreviations

ABBREVIATION	DESCRIPTION
BAM	*Biodiversity Assessment Method*
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	*Biodiversity Development Assessment Report*
BOS	*Biodiversity Offsets Scheme*
BV Map	*Biodiversity Values Map*
DotEE	*Department of the Environment and Energy*
EEC	*Endangered Ecological Community*
ELA	*Eco Logical Australia Pty Ltd*
EPA Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FFA	*Flora & Fauna Assessment*
LGA	*Local Government Area*
MNES	*Matters of National Environmental Significance*
NW Act	*Noxious Weeds Act 1993* (NSW)
OEH	*NSW Office of Environment and Heritage*
TEC	*Threatened Ecological Community*
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
WoNS	*Weeds of National Significance*

Executive summary

This assessment was prepared to accompany a planning proposal by Blacktown City Council (BCC) for the rezoning and reclassification of lands around St Bartholomew's Cemetery, Prospect for the proposed expansion of the cemetery. A preliminary impact assessment is provided regarding biodiversity impacts associated with the planning proposal and future development for the cemetery expansion.

This report outlines the biodiversity values present across the study area, from desktop literature review and vegetation validated during a field survey. Potential ecological impacts were assessed in relation to State and Commonwealth legislation, namely the NSW *Biodiversity Conservation Act 2016* (BC Act), formerly the *Threatened Species Conservation Act 1995* (TSC Act), and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The desktop analysis determined that the majority of the study area was highly modified and predominantly cleared of native vegetation, however several patches of remnant native vegetation were mapped within the study area. One threatened ecological community (TEC), Cumberland Plain Woodland, listed as a critically endangered ecological community (CEEC) under the BC and EPBC Act was mapped within the study area.

The field survey confirmed the presence of Cumberland Plain Woodland (CPW) within the study area. Cumberland Plain Woodland was disturbed with a high presence of exotic species in the mid-storey and groundcover. Native plantings, exotic plantings and large areas of disturbed grassland were also present in the study area.

The *Biodiversity Conservation Act 2016* (BC Act) came into effect on 25 August 2017, changing the way biodiversity (ecological) impacts are assessed and approved in NSW. The new BC Act 2016 includes a framework for the assessment methodology and introduces a new Biodiversity Offsets Scheme (BOS) that applies at the Development Application stage. Impacts can be offset by purchasing and retiring biodiversity credits. If removal of 0.5 ha or more of native vegetation is proposed subsequent to the Planning Proposal being approved, area threshold criteria will be exceeded and entry into the BOS will be triggered. The study area also contains land mapped on the Biodiversity Value Map which, if removed, will also trigger the BOS. If both these criteria are not triggered, Tests of Significance will need to be conducted.

The BC Act also has provisions that require the refusal of a development application that has a 'serious and irreversible impact' (SAII) on biodiversity values. The OEH have released guidelines for SAII – which include a list of species and ecological communities that are candidates for SAII, one of which is Cumberland Plain Woodland. However, at the time of writing, the thresholds for what is considered a SAII have not been published by the NSW government.

These requirements under the BC Act will be addressed at the Development Application stage. For the purposes of the Planning Proposal, this report describes the biodiversity values of the site that may be affected by subsequent development.

1 Introduction

1.1 Description of the project

Eco Logical Australia (ELA) was commissioned by Blacktown City Council (BCC) to undertake an ecological assessment to support a planning proposal for the expansion of Bartholomew's Cemetery at Prospect.

Following the planning proposal, a Development Application (DA) will be submitted for the proposed expansion of the cemetery to be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EPA Act). This ecological assessment will inform the proposed zoning of the site and the design of the cemetery expansion.

1.2 Study Area

The majority of the study area (**Figure 1**) is cleared of vegetation and was composed of disturbed grasslands and exotic vegetation. Two patches of remnant native vegetation in the form of Cumberland Plain Woodland (CPW) were present in the study area. Several patches of planted exotic and native vegetation were also present throughout the study area. Bartholomew's Cemetery and church is located in the west of the study area, including a small number of buildings. The heritage listed Prospect Post Office is located in the east of the study area. The study area is bounded by Ponds Road and Great Western Highway to the north, Prospect Highway to the west, Western Motorway to south and a commercial building to the east.

1.3 Scope of Works

The planning proposal involves the following:

- reclassify the Council-owned expansion lands from 'community land' to 'operation land' and rezone the cemetery expansion
- rezone the cemetery expansion lands from RE1 Public Recreation, RU4 Primary Production Small Lots and SP2 – Classified Road, under BLEP2015 to SP1 Cemetery

1.4 Terminology

The following key terms and definitions are used in this ecological assessment:

- Planning proposal – the proposed rezoning and reclassification of lands within the study area. This does not refer to the expansion of the cemetery.
- Subject site – the area directly affected by the proposal (DECC, 2007)
- Study area – means the subject site and additional areas surveyed for the proposal including those areas likely to be directly or indirectly affected by the proposal.

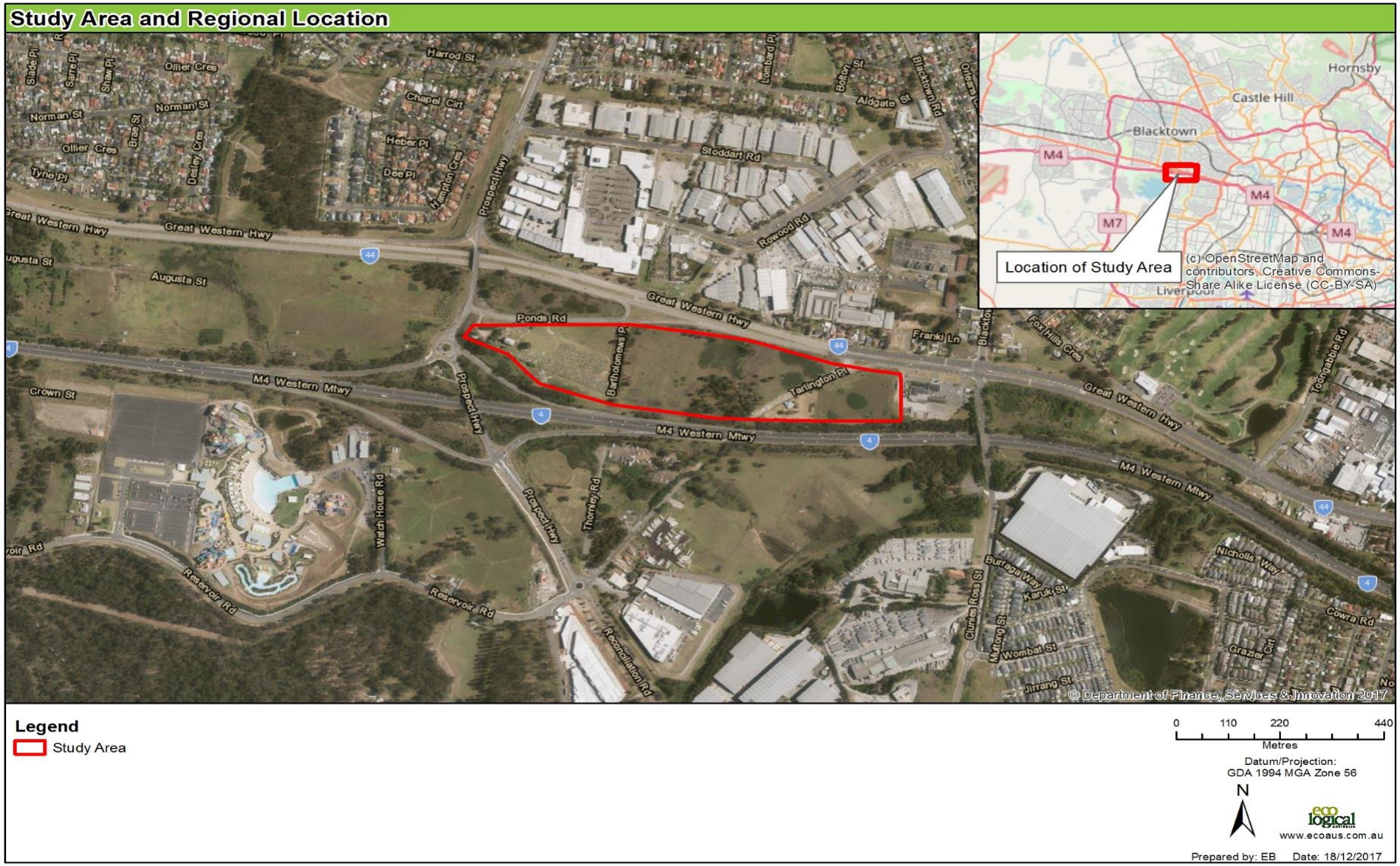

Figure 1: Location of the study area

2 Legislative Context

Table 1 below provides a description of the relevant legislative context for the ecological assessment. Approvals and/or legislative consideration will be required for the development of the study area. This report addresses the objectives and requirements of the legislation as it relates to biodiversity and ecological values.

Table 1: Legislative context

Name	Relevance to the project	Section in this report
Commonwealth		
Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Matters of National Environmental Significance (MNES) have been identified as having a potential to occur within the locality. An action that has a significant impact on MNES will be a Controlled Action and require approval from the Minister for the Environment. Whilst a Planning Proposal is not an 'action' under the EPBC Act, this report, describes the presence of MNES in the study site.	Section 5.5
State		
Biodiversity Conservation Act 2016	The *Biodiversity Conservation Act 2016* outlines the assessment requirements to determine whether proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats under section 7.3 and whether the Biodiversity Offsets Scheme (BOS) will be triggered. Whilst Planning Proposals (i.e. rezoning land) do not trigger the offset scheme, this report lists the potential impacts that may trigger entry into the BOS at the DA stage.	Section 5.4
Biodiversity Conservation Regulation 2017	The Biodiversity Values Map (BV Map) identifies land with high biodiversity value, as defined by the *Biodiversity Conservation Regulation 2017*. The study area contains land identified on the Biodiversity Values Map.	Section 5.4
Biosecurity Act 2015	Under this Act, priority weeds have been identified for Local Government Areas and assigned strategies to contain, remove or manage. Occupiers of land (this includes owners of land) have responsibility for taking appropriate action for priority weeds on the land they occupy. The site contains weeds listed under the Biosecurity Act.	Section 4.4
Fisheries Management Act 1994 (FM Act)	The development does not involve harm to mangroves or other protected marine vegetation, dredging, reclamation or blocking of fish passage, and therefore a permit under the FM Act is not required.	N/A
Water Management Act 2000 (WM Act)	Whilst the WM Act does not contain any provisions for Planning Proposals, it is prudent to consider the objectives of the Act when preparing a Planning Proposal. At the development Application stage a Controlled Activity Approval under the WM Act is required for development that impacts on waterfront land, which is defined as land within 40m of a watercourse or waterbody.	N/A

	As there are no watercourses within the site, a Controlled Activity Approval is unlikely to be required.	
Planning Instruments		
SEPP 44 Koala Habitat	SEPP 44 does not apply to the local government area (Blacktown City Council Council) in which the development is proposed. No further consideration under SEPP 44 is required for this proposed development	N/A
Blacktown Local Environment Plan 2015	Three different land zonings are in place in the study area: SP1 – Cemetery, RE1 – Public Recreation and RU4 – Primary Production Small Lots. The study area does not contain land mapped on the Terrestrial Biodiversity Map.	Section 1

3 Methodology

3.1 Literature review and database search

A review of readily available databases pertaining to the ecology and environmental features of the study area and surrounding area, and existing vegetation mapping was conducted to identify records of threatened species, populations and communities and their potential habitat. Databases and vegetation mapping that were reviewed included:

- BioNet (Atlas of NSW Wildlife) database search (5 km) threatened species, populations and ecological communities listed under the BC Act (OEH 2016) (Accessed November, 2017).
- EPBC Act Protected Matters Search Tool (5 km) for threatened and migratory species, populations and ecological communities listed under the Commonwealth EPBC Act (Department of the Environment and Energy (DotEE) 2017)).
- Aerial mapping and vegetation mapping (OEH 2016) to assess the extent of vegetation including mapped threatened ecological communities (TECs) listed under the BC Act and / or EPBC Act.

Aerial photography (Bing Maps and Google Earth) of the study area and surrounds were also used to investigate the extent of vegetation cover and landscape features. In addition, relevant GIS datasets (soil, geology, drainage) were reviewed.

Species from both the Wildlife Atlas and DotEE online search were combined to produce a list of threatened species, populations and communities that may occur within the study area. The likelihood of occurrences for threatened species, populations and communities in the study area was then determined based on location of database records, the likely presence or absence of suitable habitat in the study area, and knowledge of the species' ecology. This information informed the subsequent field surveys.

After the field inspections were completed the likelihood of occurrence of each species, population and communities was determined again. This was based on the increase in knowledge about the extent and type of habitats and about which species were present on the study area. The likelihood of occurrence of species, populations and communities based on the field surveys is presented within the likelihood table in **Appendix A.**

3.2 Field Surveys

The field survey was conducted by ELA ecologists Mike Lawrie and Stacey Wilson on 7 December 2017. The study area was traversed using the random meander method (Cropper 1993) to verify the presence of native vegetation, threatened ecological communities, and threatened species and / or their habitat. Where the boundaries of vegetation communities differed from existing vegetation mapping, these were modified on hard copy maps and marked with a hand-held GPS.

The collection of vegetation data using the Biodiversity Assessment Methodology (BAM) was undertaken and their cover-abundance were recorded. One full floristic plot (20 x 20 m quadrat) was assessed within an area previously mapped as Cumberland Plain Woodland (CPW) (OEH 2016). The collection of plot data was used to validate the composition and quality of CPW and conform to requirements of the BAM.

Bird species and other fauna were recorded opportunistically. Targeted surveys were not undertaken for any threatened species.

3.3 Survey Limitations

This assessment was not intended to provide an inventory of all species present across the study area but instead an overall assessment of the ecological values of the study area with particular emphasis on threatened species, endangered ecological communities and key fauna habitat features. It is important to note that some species may not have been detected on the study area during the inspection as they may be cryptic or seasonal and only detectable during flowering or during breeding. In this case the likelihood of their occurrence on site has been assessed based on the presence of potential habitat.

The field survey was undertaken using hand-held GPS units. It is noted that these units can have errors in accuracy of approximately 20 m (subject to availability of satellites on the day).

4 Results

4.1 Literature review

A review of previous vegetation mapping within the study area (OEH 2016) found one native vegetation community, Cumberland Plain Woodland, present within the south of the study area. Cumberland Plain Woodland is listed Critically Endangered Ecological Community (CEEC) under the BC and EPBC Acts. A second vegetation community, Urban Exotic/Native, was mapped also mapped in the west of the study area. This community is not consistent with any native remnant vegetation community.

The desktop literature review identified a total of 63 threatened species listed under the BC Act, EPBC Act, or Fisheries Management (FM) Acts, which may have the potential to occur within a 5 km radius of the study area.

An assessment of the likelihood of occurrence of threatened flora species within the study area is provided in **Appendix A**. The threatened flora and fauna species that were identified within the desktop assessment as having a potential, likely or known occurrence within the study area include:

- *Meridolum corneovirens* (Cumberland Plain Land Snail)
- *Artamus cyanopterus cyanopterus* (Dusky Woodswallow)
- *Hieraeetus morphnoides* (Little Eagle)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Lathamus discolor* (Swift Parrot)
- *Ninox strenua* (Powerful Owl)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)

4.2 Soils and topography

The study area is almost entirely located on Blacktown residual (bt) soil landscpe, with only a small area located on South Creek alluvial (sc) soil landscape in the south-east corner of the study area. Blacktown residual soils occur on gently undulating rises on Wianamatta Group shales with local relief to 30 m and slopes usually >5%. The underlain geology consists of Wianamatta Group—Ashfield Shale, Bringelly Shale and Minchinbury Sandstone. South Creek alluvial soils occur along the floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain. The topography is generally flat to gently sloping alluvial plain with occasional terraces or levees providing low relief with slopes <10m. The underlying geology consists of Quaternary alluvium derived from Wianamatta Group shales and Hawkesbury Sandstone (Chapman & Murphy, 1989). The topography of the study area was flat to undulating, sloping up in the west of the study area.

4.3 Field Survey Results

4.3.1 Vegetation Communities

The field survey confirmed the presence of Cumberland Plain Woodland as previously mapped, however there was a wider occurrence of CPW within the study area than had been previously mapped. The study

area also contained areas of planted native and planted exotic vegetation. The majority of the study area was composed of disturbed grassland and exotic vegetation with a dominance of weeds.

Cumberland Plain Woodland (CPW)

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

CPW covered approximately 1.46 ha of the study area. The majority of CPW was in relatively poor condition with a high presence of weeds and isolation of patches from other areas of CPW. The canopy was composed almost entirely of *Eucalyptus moluccana* (Grey Box). A small number of *Eucalyptus tereticornis* (Forest Red Gum) were also present in the canopy. *Amyema miquelii* (Box Mistletoe) was common within *E. moluccana.*

The mid-storey was highly disturbed and consisted of exotic species *Olea europaea* subsp *africana* (African Olive) and *Callitris* sp. Regenerating eucalypts were sparse in the mid-storey. The shrub layer was dominated by the introduced species *O. europaea* subsp. *africana, Lyssium ferocissimum* (African Boxthorn), *Ligustrum lucidum* (Broad-leaved Privet). The native *Bursaria spinosa* subsp. *spinosa* (Blackthorn) was also present in the shrub layer.

The ground cover was disturbed and composed of a mixture of native and exotic grasses, herbs and forbs. The groundcover was highly disturbed by invasive species. Those dominant within CPW included *Pennisetum clandestinum* (Kikuyu), *Sida rhombifolia* (Paddy's Lucerne), *Avena barbata* (Wild Oats), *Verbena bonariensis* (Purple Tops), *Ehrharta erecta* (Panic Veldt Grass) and *Plantago lanceolata* (Plantain). Native species common within CPW in the study area included *Microlaena stipoides* var. *stipoides* (Weeping Meadow Grass), *Themeda triandra* (Kangaroo Grass), *Einadia hastata* (Berry Saltbush), *Einadia polygonoides, Dichondra repens* (Kidney Weed), *Pseuderanthemum variabile* (Pastel Flower) and *Dianella caerulea* (Blue Flax-lily).

Note that the EPBC guidelines for CPW are more stringent than the BC guidelines. The largest patch of CPW within the study area was classified as EPBC listed CPW during preliminary assessments. A more detailed study of the native ground cover across the entire patch would be able to determine more accurately the total percent of native groundcover across the patch and whether it would classify for EPBC listing.

Disturbed Grassland/Exotic

No equivalent PCT

The majority of the study area was composed of disturbed grassland and exotic vegetation. Dominant species within these areas were *Pennisetum clandestinum* (Kikuyu), *Chloris gayana* (Rhodes Grass), *Paspalum dilatatum, Eragrostis curvula* (African Love Grass), *Senecio madagascariensis* (Fireweed), *Bidens pilosa* (Cobbler's Pegs), *Hypochaeris radicata* (Flatweed) *Parietaria judaica* (Asthma Weed) and *Conyza bonariensis* (Fireweed). Exotic shrubs within areas of exotic vegetation included *Senna pendula* var. *glabrata, Olea europaea* subsp. *cuspidata* (African Olive), *Lycium ferocissimum* (African Boxthorn), *Solanum mauritianum* (Wild Tobacco), *Ligustrum lucidum* (Broad-leaved Privet) and *Lantana camara* (Lantana). Large patches of *Rubus fruticosus* (Blackberry) and *Cortaderia selloana* (Pampas Grass) were present across the study area.

Planted Natives

No equivalent PCT

Several native plantings had been undertaken for landscaping around the cemetery roadsides and old post office building making up 0.23 ha of the study area. Species included *Corymbia maculata* (Spotted Gum), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus microcorys* (Tallowwood), *Melaleuca linearifolius* (Flax-leaved Paperbark), *Callistemon salignus* (Willow Bottlebrush), *Melaleuca armillaris* (Bracelet Honey Myrtle), *Araucaria bidwillii* (Bunya Pine) and *Grevillea robusta* (Silky Oak).

Planted Exotics

No equivalent PCT

A number of exotic flora had been planted in the west of the site around the graveyard and church including *Erythrina x sykesii* (Coral Tree), *Pinus radiata* (Radiata Pine) and *Cupressus sempervirens* (Mediterranean Pine). The total area of exotic plantings was approximately 0.12 ha.

Plate 1: Cumberland Plain Woodland within the study area

Plate 2: Cumberland Plain Woodland within the study area

Plate 3: Disturbed Grassland/Exotic

Plate 4: Planted natives *Ficus macrophylla* and *Araucaria bidwillii* (left) and planted exotics *Erythrina x sykesii* (right) adjacent to church.

Figure 2: Validated vegetation map of the study area (ELA 2017)

4.4 Flora Species

A total of 89 flora species were identified within the study area. No threatened flora species were recorded during the field survey. The study area is unlikely to provide suitable habitat for any threatened flora species due to the high level of disturbance and weed incursion

Exotic flora species were high in diversity and abundance, particularly within the understorey. Fifty-seven exotic species were identified within the study area (**Appendix B)** including three declared as priority weeds under the *Biosecurity Act 2015* in Blacktown LGA (**Table 2**). Two of these noxious weeds are also listed as *Weeds of National Significance* (WoNS).

Table 2: NSW Priority Weeds and WoNS species recorded within the study area

Scientific Name	Common Name	WoNS	Priority Weed Objective
State level			
Asparagus aethiopicus	Ground Asparagus	Yes	*Prohibition on dealing*[1]
Senecio madagascariensis	Fireweed	Yes	*Prohibition on dealings*[1]
Olea europaea ssp *africana*	African Olive	No	*Regional Recommended Measure*[2]
Cortaderia selloana	Pampas Grass	No	*General Biosecurity Duty*[3]
Rubus fruticosus	Blackberry	Yes	*Prohibition on dealing*[1]
Lycium ferocissimum	African Boxthorn	Yes	*Prohibition on dealing*[1]
Lantana camara	Lantana	Yes	*Prohibition on dealing*[1]

[1]*Prohibition on dealings:* Must not be imported into the State or sold

[2]*Regional Recommended Measure:* An exclusion zone is established for all lands in Blue Mountains City Council and Central Coast local government areas. The remainder of the region is classified as the core infestation area. Whole region: The plant or parts of the plant are not traded, carried, grown or released into the environment. Exclusion zone: The plant is eradicated from the land and the land kept free of the plant. Core infestation area: Land managers prevent spread from their land where feasible

[3]*General Biosecurity Duty:* All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

4.5 Fauna and Fauna Habitat

Seven fauna species were recorded during the field survey most of which were common urban birds. All fauna species recorded were native. A full list of fauna species recorded during the field survey is shown in **Appendix B**.

An assessment of the habitat features was used to determine the suitability of the study area to support native fauna species, including threatened species (**Appendix A**). While vegetation within the study area was disturbed, habitat opportunities existed for a variety of threatened fauna species:

Invertebrates

Low quality habitat for *Meridolum corneovirens* (Cumberland Plain Land Snail) (CPLS) was available within CPW. Habitat features such as woody debris, defoliating bark and leaf litter was present. Habitat was considered marginal however, due to the high presence of exotic groundcover species throughout the study area. The cemetery expansion would result in the removal of low quality habitat for CPLS from

the study area. Targeted surveys are required to be undertaken to determine the presence or absence of this species.

Avifauna

Foraging and sheltering resources were fairly available in the canopy layer and mid-storey of CPW within the study area. Highly mobile avifauna and woodland birds such as *Artamus cyanopterus cyanopterus* (Dusky Woodswallow), *Glossopsitta pusilla* (Little Lorikeet) and *Lathamus discolor* (Swift Parrot) may utilise foraging resources within areas of native vegetation within the study area. Suitable hunting habitat was present for threatened predatory birds including *Hieraaetus morphnoides* (Little Eagle) and *Ninox strenua* (Powerful Owl). Roosting habitat was available for some hollow-roosting avifauna species, however no suitable sized hollows for nesting owls were available. Threatened avifauna species with potential habitat within the study area are highly mobile and considered unlikely to rely on foraging resources within the study for survival. The proposal may result in the removal of foraging/hunting habitat for a small number of threatened avifauna species. Those threatened avifauna species that may utilise the site would be highly mobile due to the significant fragmentation of vegetation in the locality and it is unlikely that any threatened birds would be reliant on resources within the study area for survival.

Bats

Seasonal foraging habitat was available within the study area for *Pteropus poliocephalus* (Grey-headed Flying Fox) within flowering myrtaceous species. No roosting habitat was present for this species. Grey-headed Flying-fox is highly mobile and has abundant foraging resources in the locality. Foraging habitat was also available for several microchiropteran bat species including *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Miniopterus schreibersii oceanensis* (Eastern Bentwing Bat), *Mormopterus norfolkensis* (Eastern Freetail Bat), *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat) and *Scoteanax rueppellii* (Greater Broad-nosed Bat). Roosting/nesting habitat was available for those microbat species which utilise tree hollows. The study area did not contain suitable roosting/nesting for cave roosting species. The proposal may result in the removal of foraging habitat for Grey-headed Flying Fox or and the above listed microbat species. Several hollow-bearing trees were identified, containing roosting habitat for *F. tasmaniensis, M. norfolkensis, S. flaviventris* and *S. rueppellii.*

5 Assessment

5.1 Potential Impacts

Whilst the rezoning of land itself does not result in impacts to biodiversity, the rezoning is proposed to allow for future use of the site for cemetery and associated infrastructure. Impacts to the Cumberland Plain Woodland should be avoided if possible. If this is not possible, development may trigger the Biodiversity Offset Scheme as described below.

When assessing impacts, the proponent at the DA stage will need to consider direct impacts such as removal of vegetation as well as indirect impacts such as:

- Changes to hydrology through run off, sedimentation and erosion from construction works.
- Spread of noxious weeds to the site or from the site – if not managed accordingly.

5.2 Biodiversity Conservation Act

The *Biodiversity Conservation Act 2016* (BC Act) came in to effect in August 2017 replacing the *Threatened Species Conservation Act 1995.* Impacts to threatened species and threatened ecological communities listed under the BC Act are required to be assessed in accordance with Section 7.3 of the BC Act, known as 'assessment(s) of significance'.

For a development under Part 4 of the EPA Act, the Biodiversity Offsets Scheme (BOS) and Biodiversity Assessment Method (BAM) may be triggered by the following means:

- Area Criteria - exceeding the clearing area threshold (**Table 3**)
- Development likely to have a significant impact on a threatened species or ecological community Impacting an area shown on the Biodiversity Value Map
- Impacting an Area of outstanding Biodiversity Value.

As determined in Section 5.3.1 and 5.3.2 below, the BOS will be triggered as a result of the development under the Area Criteria and/or the Biodiversity Value Map.

5.2.1 Biodiversity Offsets Scheme – Area Threshold

The area threshold is triggered when an area of native vegetation* to be cleared reaches the thresholds for the relevant lot size is reached (see **Table 3**). The total area of Bartholomew's Cemetery is approximately 14.2 ha. Given this, removal of 0.5 ha would exceed the area clearing threshold and the BOS and BAM would be triggered.

Table 3: Area clearing threshold

Minimum lot size associated with the property	Threshold for clearing native vegetation, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

* Note: native vegetation is defined in Section 1.6 of the BC Act (and has the same meaning as in Part 5A of the *Local Land Services Act 2013*); essentially encompasses any species native to NSW and does not necessarily conform to a PCT.

5.2.2 Offset Scheme Thresholds – Biodiversity Values Land Map

The BV Map identifies land considered to have high biodiversity value as defined by the *Biodiversity Conservation Regulation 2017.* The study area does contain areas of high biodiversity value as mapped on the BV Map (**Figure 3**).

5.2.3 Test of Significance (BC Act)

If either the area threshold criteria is exceeded, or development is proposed within areas mapped on the Biodiversity Values Map, Tests of Significance are not required. However, if this is not the case Tests of Significance will need to be undertaken. A preliminary assessment concludes the following regarding the CPW present on site:

The site contains approximately 1.42 ha of CPW. Due to the high level of fragmentation of vegetation in the locality from major roads, industrial and residential developments the local occurrence of CPW is located between the confines of Great Western Highway, Western Motorway, Ponds Highway and Clunies Ross Street. If the entirety of this vegetation is removed, it is likely to be considered a Significant Impact under Section 7.3 of the BC Act.

5.2.4 Serious and Irreversible Impacts (SAII)

The BC Act requires a consent authority to reject a Part 4 (EP&A Act) local development DA that is likely to have a SAII on biodiversity values. Cumberland Plain Woodland is a candidate ecological community for SAIIs under the BC Regulation. While thresholds for causing a SAII are to be set by OEH, these are yet to be published. At this stage a SAII cannot be determined until the thresholds are released by OEH.

5.3 Significance Assessment (EPBC Act)

One threatened species, *Pteropus policephalus* (Grey-headed Flying Fox) has potential habitat in the study area and one TEC Cumberland Plain Woodland was present within the study area. This species and ecological community will require a more in depth assessment during the DA stage to assess the potential for a significant impact.

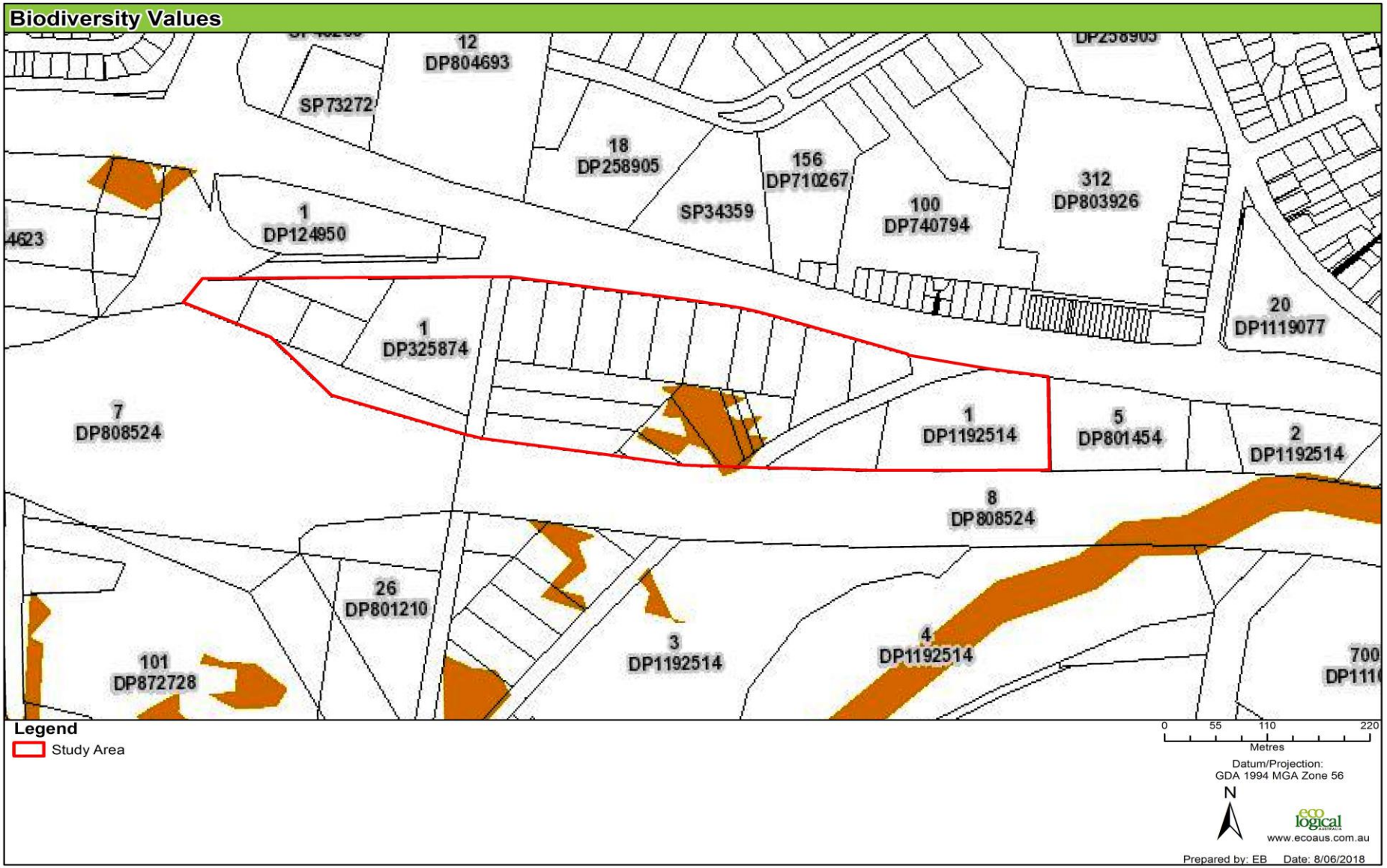

Figure 3: Biodiversity Value Map (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap**)**

6 Conclusion

The planning proposal itself will not have an impact on biodiversity values, as rezoning of land is not approval for development. However, the Planning proposal is to enable development of the site as an expanded cemetery and associated infrastructure.

Section 5 outlines certain factors that need to be considered during the DA stage, which may trigger the Biodiversity Offset Scheme leading to the requirement of a Biodiversity Development Assessment Report at the DA stage. The BDAR will detail the biodiversity impacts and identify the number and type of biodiversity credits that would need to be retired if the development is approved.

Consideration of 'Serious and Irreversible Impacts' will be required once the triggers for SAII are published.

7 References

Australian Government Department of the Environment (DotE) 2013. The EPBC Act Significant impact guidelines 1.1 – Matters of National Environmental Significance.

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Appendix A Likelihood of Occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- "yes" - the species was or has been observed on the site
- "likely" = a medium to high probability that a species uses the site
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the site
- "no" = habitat on site and in the vicinity is unsuitable for the species.

An assessment of significance was conducted for threatened species or ecological communities that were recorded within the site or had a higher likelihood of occurring and were not recorded during the site visit and that potential to be significantly impacted. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the site intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, an assessment of significance in reference to State or Commonwealth legislation was not considered necessary.

Note, that assessments for the likelihood of occurrence were made both prior to site inspection and following site inspection. The pre-survey assessments were performed to determine which species were "affected species", and hence determine which sorts of habitat to look for during site inspection. The post-survey assessments to determine "final affected species" were made after observing the available habitat in the site and are depicted in the table below.

The records column refers to the number of records occurring within 5 km of the study area, as provided by the NSW Wildlife Atlas (BioNet) database search.

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database (DotEE 2017b) and the NSW Threatened Species Profiles (OEH 2017a).

Table 4: Threatened ecological communities (TECs) likelihood table

Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Castlereagh Scribbly Gum and Agnes Banks Woodland	V	EEC	Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion. Dominated by *Eucalyptus parramattensis* subsp. *parramattensis*, *Angophora bakeri* and *E. sclerophylla.* A small tree stratum of *Melaleuca decora* is sometimes present, generally in areas with poorer drainage. It has a well-developed shrub stratum consisting of sclerophyllous species such as *Banksia spinulosa* var. *spinulosa, Melaleuca nodosa, Hakea sericea* and *H. dactyloides* (multi-stemmed form). The ground stratum consists of a diverse range of forbs including *Themeda australis, Entolasia stricta*, *Cyathochaeta diandra, Dianella revoluta* subsp. *revoluta, Stylidium graminifolium*, *Platysace ericoides*, *Laxmannia gracilis* and *Aristida warburgii.*	No
Coastal Upland Swamps in the Sydney Basin Bioregion	E	EEC	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateaux) to the Robertson district in the south (n the Woronora plateau). Occurs primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils. May include tall open scrubs, tall closed scrubs, closed heaths, open graminoid heaths, sedgelands and fernlands. Larger examples may include a complex of these structural forms.	No

Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Cooks River / Castlereagh Ironbark Forest	E	CEEC	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (bangalay) and *E. elata* (river peppermint) may be common south from Sydney. *E. ovata* (swamp gum) occurs on the far south coast, *E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (prickly-leaved teatree), *Backhousia myrtifolia* (grey myrtle), *Melia azadarach* (white cedar), *Casuarina cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa, Solanum prinophyllum, Rubus parvifolius, Breynia oblongifolia, Ozothamnus diosmifolius, Hymenanthera dentata, Acacia floribunda* and *Phyllanthus gunnii.* The groundcover is composed of abundant forbs, scramblers and grasses.	No
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	CEEC	CEEC	Has an open forest structure and occurs primarily where shallow deposits from ancient river systems overlay shale soils, but also associated with localised concentrations of iron-hardened gravel. A transition plant community which grades into Cumberland Plain Woodland where the influence of gravel soil declines, and grades into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thick. Was not recorded during the site inspection s.	Yes
River-flat Eucalypt Forest	EEC	-	The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include *Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains.	No

Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Shale/Sandstone Transition Forest	CEEC	CEEC	Occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with earthy and sandy soils from sandstone, or where shale caps overlay sandstone. The boundaries are indistinct, and the species composition varies depending on the soil influences. It typically occurs in moderately wet sites, with an annual rainfall of 800-1100mm per year, and on clay soils derived from Wianamatta shale. The tree canopy is dominated by Turpentine and a variety of eucalypt species. Its distribution is mainly on the Cumberland Plain of the Sydney region. Was not recorded during the site inspection s.	No
Turpentine-Ironbark Forest in the Sydney Basin Bioregion	EEC	CEEC	Open forest, with dominant canopy trees including *Syncarpia glomulifera* (Turpentine), *Eucalyptus punctata* (Grey Gum), *Eucalyptus paniculata* (Grey Ironbark) and *E. eugenioides* (Thin-leaved Stringybark). In areas of high rainfall (over 1050 mm per annum) *E. saligna* (Sydney Blue Gum) is more dominant. The shrub stratum is usually sparse and may contain mesic species such as *Pittosporum undulatum* (Sweet Pittosporum) and *Polyscias sambucifolia* (Elderberry Panax). Occurs close to the Shale/Sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaux. A transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges.	No
Western Sydney Dry Rainforest and Moist Woodland on Shale	EEC	CEEC	A dry vine scrub community of the Cumberland Plain, western Sydney. Canopy trees include Prickly Paperbark (*Melaleuca styphelioides*), Hickory Wattle (*Acacia implexa*) and Native Quince (*Alectryon subcinereus*). Many rainforest species occur in the shrub layer, such as Mock Olive (*Notelaea longifolia*), Hairy Clerodendrum (*Clerodendrum tomentosum*) and Yellow Pittosporum *(Pittosporum revolutum*). The shrub layer combines with vines, such as Gum Vine (*Aphanopetalum resinosum*), Wonga Vine (*Pandorea pandorana*) and Slender Grape (*Cayratia clematidea*) to form dense thickets in sheltered locations.	No

E= Endangered Ecological Community, CEEC = Critically Endangered Ecological Community.

Table 5: Threatened flora species likelihood table

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of Occurrence
Acacia bynoeana	Bynoe's Wattle	E	V	*Acacia bynoeana* is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains, and has recently been found in the Colymea and Parma Creek areas west of Nowra. It is found in heath and dry sclerophyll forest, typically on a sand or sandy clay substrate, often with ironstone gravels.	0	Unlikely. Suitable habitat not present.
Acacia pubescens	Downy Wattle	V	V	*Acacia pubescens* occurs on the NSW Central Coast in Western Sydney, mainly in the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. It is associated with Cumberland Plains Woodlands, Shale / Gravel Forest and Shale / Sandstone Transition Forest growing on clay soils, often with ironstone gravel.	20	Unlikely. Suitable habitat not present.
Allocasuarina glareicola		-	E	*Allocasuarina glareicola* is primarily restricted to the Richmond district on the north-west Cumberland Plain, with an outlier population found at Voyager Point. It grows in Castlereagh woodland on lateritic soil.	0	Unlikely Suitable habitat not present. No local records.
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	It is known from a range of vegetation communities including swamp-heath and woodland. The larger populations typically occur in woodland dominated by *Eucalyptus sclerophylla* (Scribbly Gum), *E. sieberi* (Silvertop Ash), *Corymbia gummifera* (Red Bloodwood) and *Allocasuarina littoralis* (Black Sheoak); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	0	Unlikely. Suitable habitat was not available. No local records.
Cynanchum elegans	White-flowered Wax Plant	E	E	Dry rainforest; littoral rainforest; Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia (Coastal Tea-tree– Coastal Banksia) coastal scrub; Eucalyptus tereticornis (Forest Red Gum) or Corymbia maculata (Spotted Gum) open forest and woodland; and Melaleuca armillaris (Bracelet Honeymyrtle) scrub.	0	Unlikely Suitable habitat not present. No local records.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of Occurrence
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	Dry grassy woodland, on shallow soils of slopes and ridges.	1	No. Site outside natural range of species.
Genoplesium baueri	Yellow Gnat-orchid	V	E	Known from coastal areas from northern Sydney south to the Nowra district. Previous records from the Hunter Valley and Nelson Bay are now thought to be erroneous. Grows in shrubby woodland in open forest on shallow sandy soils and flowers from December to March.	0	Unlikely Suitable habitat not present.
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	V		Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest, on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium.	3	Unlikely Degraded habitat present. Not recorded during site inspection.
Marsdenia viridiflora subsp. *viridiflora*	*Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2		Vine thickets and open shale woodland.	5	Unlikely Degraded habitat present. Not recorded during site inspection.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of Occurrence
Persoonia nutans	Nodding Geebung	E	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	2	Unlikely. Suitable habitat not present.
Pelargonium sp. *Striatellum* (G.W Carr 20345)	Omeo Stork's-bill	E	E	In NSW, *Pelargonium* sp. *Straitellum* (G.W. Carr 10345) is known from the Southern Tablelands (PlantNet 2011). Otherwise, only known from the shores of Lake Omeo near Benambra in Victoria where it grows in cracking clay soil that is probably occasionally flooded (Walsh & Entwisle 1999).	0	No. Suitable habitat not present. No local records
Pimelea spicata	Spiked Rice-flower	E	E	In western Sydney, *Pimelea spicata* occurs on an undulating topography of well-structured clay soils, derived from Wianamatta shale. It is associated with Cumberland Plains Woodland, in open woodland and grassland often in moist depressions or near creek lines. Has been located in disturbed areas that would have previously supported	104	Unlikely. Suitable habitat not present.
Pterostylis gibbosa	Illawarra Greenhood	-	E	Known from a small number of populations in the upper Hunter Valley (Milbrodale), the Illawarra region (Albion Park and Yallah) and near Nowra (DECC 2007). Plants grow in a variety of woodland and open forest communities with shallow rocky soils.	0	Unlikely. Suitable habitat not present.
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Terrestrial orchid predominantly found in Hawkesbury Sandstone Gully Forest growing in small pockets of soil that have formed in depressions in sandstone rock shelves. Known from Georges River National Park, Ingleburn, Holsworthy, Peter Meadows Creek, St Marys Tower.	0	Unlikely. Suitable habitat not present.
Pultenaea parviflora		E	V	Endemic to the Cumberland Plain. Core distribution is from Windsor to Penrith and east to Dean Park. Outlier populations are recorded from Kemps Creek and Wilberforce. May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.	16	Unlikely. Suitable habitat not present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of Occurrence
Syzygium paniculatum	Magenta Lillypilly	V	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities. In the Ourimbah Creek valley, *S. paniculatum* occurs within gallery rainforest with *Alphitonia excelsa*, *Acmena smithii*, *Cryptocarya glaucescens*, *Toona ciliata*, *Syzygium oleosum* with emergent *Eucalyptus saligna*. At Wyrrabalong NP, *S. paniculatum* occurs in littoral rainforest as a co-dominant with *Ficus fraseri*, *Syzygium oleosum*, *Acmena smithii*, *Cassine australe*, and *Endiandra sieberi*.	1	Unlikely. Suitable habitat not present.
Thesium australe	Austral Toadflax	V	V	Widespread throughout the eastern third of NSW but most common on the North Western Slopes, Northern Tablelands and North Coast. Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (DECC 2007). The preferred soil type is a fertile loam derived from basalt although it occasionally occurs on metasediments and granite.	0	Unlikely. Suitable habitat not present.

Table 6: Fisheries Management Act species likelihood table

Scientific Name	Common Name	TSC Act	EPBC Act	FM Act	Habitat Associations	Records	Habitat present within study area	Likelihood of occurrence
Macquarie australasica	Macquarie Perch	-	E	E	Habitat for this species is bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	0	Suitable habitat not present	No
Prototroctes maraena	Australian Grayling	--	V	PE	Historically, this species inhabited coastal streams from the Grose River southwards through NSW, VIC and TAS. On the mainland, this species has been recorded from rivers flowing east and south of the main dividing range. This species spends only part of its lifecycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops. Grayling migrate between freshwater streams and the ocean and as such it is generally accepted to be a diadromous species (migratory between fresh and salt waters).	0	Suitable habitat not present	No

V= Vulnerable; E= Endangered, PE= Presumed extinct.

Table 7: Threatened fauna species likelihood table

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
Amphibia						
Heleioporus australiacus	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest (Ehmann 1997). Associated with semi-permanent to ephemeral sand or rock based streams, where the soil is soft and sandy so that burrows can be constructed.	0	No. Suitable habitat not present
Litoria aurea	Green and Golden Bell Frog	E	V	It can utilise a variety of natural and man-made waterbodies such as coastal swamps, marshes, lakes, other estuary wetlands, riverine floodplain wetlands, stormwater detention basins, farm dams, bunded areas, drains, ditches and other structures capable of storing water. Permanent swamps and ponds with established fringing vegetation (e.g. *Typha* sp. and spikerushes–*Eleocharis* sp.) adjacent to open grassland areas for foraging and free from predatory fish such as Mosquito Fish (*Gambusia holbrooki*) are also.	14	No. Suitable habitat not present.
Litoria raniformis	Southern Bell Frog	E	V	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area. Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Also found in irrigated rice crops.	0	No. Suitable habitat not present.
Gastropoda						
Meridolum corneovirens	Cumberland Plain Land Snail	E	-	Associated with open eucalypt forests, particularly Cumberland Plain Woodland (CPW) described in Benson (1992). Found under fallen logs, debris and in bark and leaf litter around the trunk of gum trees or burrowing in loose soil around clumps of grass. Urban waste may also form suitable habitat.	17	Potential. Degraded habitat present.
Aves						

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
Anthochaera phrygia	Regent Honeyeater	CE	E & M	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (*C. cunninghamiana*). It primarily feeds on nectar from box and ironbark eucalypts and occasionally from Banksia's and mistletoes. It is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar. Suitable habitat likely to be present within the Precinct.	0	Unlikely Suitable habitat not present.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	The Dusky Woodswallow is found in open forests and woodlands, and may be seen along roadsides and on golf courses. The Dusky Woodswallow nests colonially in 'neighbourhoods'. The nest is a loose bowl of twigs, grass and roots, lined with fine grass, and is placed in a tree fork, behind bark, in a stump hollow or in a fence post, about 1 m - 10 m above the ground.	2	Potential Marginal habitat available within site.
Botaurus poiciloptilus	Australasian Bittern	E	E	Occurs in terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats, reedbeds, swamps, streams, and estuaries.	0	No. Suitable habitat not present
Calidris ferruginea	Curlew Sandpiper	E	CE, Mi	Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	0	No. Suitable habitat not present.
Daphoenositta chrysoptera	Varied Sittella	V	-	Distribution includes most of mainland Australia except deserts and open grasslands. Prefers eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods from bark, dead branches, or small branches and twigs.	2	Unlikely Suitable habitat not present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
Dasyomis brachypterus	Eastern Bristlebird	E1	E1	Habitat is characterised by dense, low vegetation and includes sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest, as well as open woodland with a heathy understorey. In northern NSW occurs in open forest with tussocky grass understorey.	0	No. Suitable habitat not present. Site outside known range for this species.
Falco subniger	Black Falcon	V		Woodland, shrubland and grassland, especially riparian woodland and agricultural land. Often associated with streams or wetlands.	1	Unlikely Suitable habitat not present.
Glossopsitta pusilla	Little Lorikeet	V		Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	0	Potential Foraging habitat available for this species.
Grantiella picta	Painted Honeyeater		V	A nomadic species that typically inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests with abundant mistletoe (DECC 2007). It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring *Amyema* sp mistletoe (DECC 2007).	0	Unlikely Suitable habitat not present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
Hieraeetus morphnoides	Little Eagle	V		Open eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.	4	Potential Hunting habitat available.
Lathamus discolor	Swift Parrot	E	CE	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts. Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*).	14	Potential Marginal winter foraging habitat available. Preferred foraging species not present.
Numenius madagascariensis	Eastern Curlew	-	CE	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	0	No. Suitable habitat not present. No local records.
Pandion cristatus	Eastern Osprey	V	M	Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	0	Unlikely Suitable habitat not present.
Rostratula australis	Australian Painted Snipe		E	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 (ibid.). Breeding is	0	Unlikely.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
				often in response to local conditions; generally occurs from September to December. Roosts during the day in dense vegetation. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter (ibid.).		No suitable habitat present within site. No local records.
Nocturnal aves						
Ninox connivens	Barking Owl	V		Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	1	Unlikely. Preferred habitat not present.
Ninox strenua	Powerful Owl	V	-	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes. Large trees with hollows at least 0.5m deep are required for shelter and breeding (Environment Australia 2000). Has been recorded approximately 1 km from the proposed sewer lines.	2	Potential. Marginal hunting habitat present. No roosting/nesting habitat present.
Tyto novaehollandiae	Masked Owl	V	-	Associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland and especially the ecotone between wet and dry forest, and non-forest habitat. Known to utilise forest margins and isolated stands of trees within agricultural land and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained.	1	Unlikely. Preferred habitat not present.
Mammals						
Dasyurus maculatus	Spotted-tailed Quoll	V	E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984;	6	Unlikely.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
				DECC 2007j), more frequently recorded near the ecotones of closed and open forest and in NSW within 200km of the coast. Preferred habitat is mature wet forest (Belcher 2000b; Green & Scarborough 1990; Watt 1993), especially in areas with rainfall 600 mm/year (Edgar & Belcher 2008; Mansergh 1984). Unlogged forest or forest that has been less disturbed by timber harvesting is also preferable (Catling et al. 1998, 2000). This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).		Suitable habitat not present.
Petauroides volans	Greater Glider		V	The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	0	Unlikely. Suitable habitat not present.
Phascolarctos cinereus	Koala	V	V	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70%, with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis.*	0	Unlikely. Suitable habitat not present.
Pseudomys novaehollandiae	New Holland Mouse	-	V	A small burrowing native rodent with a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Inhabits open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. A social animal, living predominantly in burrows shared with other individuals. The home range of the New Holland Mouse ranges from 0.44 ha to 1.4 ha and the species peaks in abundance during early to mid-stages of vegetation succession typically induced by fire.	0	No. Suitable habitat not present. Site outside known distribution of this species.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country. Roosts in caves, rock overhangs and disused mine shafts.	1	Unlikely. Suitable habitat not present.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Prefers moist habitats with trees taller than 20m. Roosts in tree hollows but has also been found roosting in buildings or under loose bark.	4	Potential. Foraging and roosting habitat available.
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	-	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland. It forages above and below the tree canopy on small insects. Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter.	17	Potential. Foraging habitat available.
Mormopterus norfolkensis	Eastern Freetail Bat	V	-	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range. Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges. Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut.	10	Potential. Foraging habitat available.
Myotis macropus	Southern Myotis	V	-	The Large-footed 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. Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water. While roosting (in groups of 10-15) it is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under	4	Unlikely. Suitable habitat not present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
				bridges, in mines, tunnels and stormwater drains. It forages over streams, dams and pools catching insects and small fish by raking their feet across the water surface.		
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. Camps are often located in gullies, typically close to water, in vegetation with a dense canopy.	37	Potential Suitable foraging habitat present within site.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Almost all habitats, including wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies. Typically roosts in hollow-bearing trees and has been known to also roost in caves.	1	Potential Foraging and roosting habitat available.
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range, tending to be more frequently located in more productive forests. Within denser vegetation types, use is made of natural and man-made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey.	5	Potential. Marginal foraging and roosting habitat available.
Listed migratory species						
Actitis hypoleucos	Common Sandpiper	-	M	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	0	No. Suitable habitat not present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
Apus pacificus	Fork-tailed Swift	-	M	Sometimes travels with Needletails. Varied habitat with a possible tendency to more arid areas but also over coasts and urban areas.	0	No. Suitable habitat not present.
Calidris acuminata	Sharp-tailed Sandpiper	-	M	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	0	No. Suitable habitat not present.
Calidris melanotos	Pectoral Sandpiper	-	M	Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	0	No. Suitable habitat not present.
Cuculus optatus	Oriental Cuckoo	-	M	Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses.	0	No. Suitable habitat not present.
Gallinago hardwickii	Latham's Snipe	-	M	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover. Occupies a variety of vegetation around wetlands including wetland grasses and open wooded swamps. Can occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers. They are regularly recorded in or around modified or artificial habitats including pasture, ploughed paddocks, irrigation channels and drainage ditches and sewage and dairy farms. They can also occur in various sites close to humans or human activity (e.g. near roads, railways, airfields, commercial or industrial complexes).	2	No. Suitable habitat not present.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
Hirundapus caudacutus	White-throated Needletail	-	M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas. Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather.	0	No. Suitable habitat not present.
Monarcha melanopsis	Black-faced Monarch	-	M	Habitat typically includes rainforest and eucalypt forests, with feeding occurring in tangled understorey.	0	No. Suitable habitat not present. No local records.
Motacilla flava	Yellow Wagtail	-	M	An insectivorous bird, inhabiting open country near water, such as wet meadows. It nests in tussocks.	0	No. Suitable habitat not present. No local records.
Myiagra cyanoleuca	Satin Flycatcher	-	M	Habitat typically includes wetter, denser forest, often at high elevations.	0	No. Suitable habitat not present. No local records.
Rhipidura rufifrons	Rufous Fantail	-	M	It is a summer breeding migrant to southeastern Australia. It is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation. Open country may be used by the Rufous Fantail during migration.	0	No. Not known within locality. Suitable habitat not available within the study area.
Tringa nebularia	Common Greenshank	-	M	Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats	6	No. Suitable habitat not

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Records	Likelihood of occurrence
				(mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).		present. No local records.

Appendix B Species Lists

Table 8: Flora species recorded within the study area

Family	Species Name	Common Name	Exotic (*)	Priority Weed/WoNS
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower		
Anacardiaceae	*Schinus molle* var. *areira*	Pepper Tree	*	
Apiaceae	*Centella asiatica*	Indian Pennywort		
Apiaceae	*Foeniculum vulgare*	Fennel	*	
Apocynaceae	*Gomphocarpus fruticosis*	Narrow-leaf Cotton Bush	*	
Apocynaceae	*Araujia sericifera*	Moth Vine	*	
Araucariaceae	*Araucaria bidwillii*	Bunya Pine		
Asparagaceae	*Asparagus aethiopicus*	Ground Asparagus	*	PW, WoNS
Asphodelaceae	*Asphodelus fistuosus*	Onion Weed	*	
Asteraceae	*Cirsium vulgare*	Spear-thistle	*	
Asteraceae	*Conyza bonariensis*	Flax-leaf Fleabane	*	
Asteraceae	*Hypochaeris radicata*	Flatweed	*	
Asteraceae	*Senecio madagascariensis*	Fireweed	*	PW, WoNS
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	*	
Asteraceae	*Taraxacum officinale*	Dandelion	*	
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	*	
Asteraceae	*Senecio* sp.		*	
Asteraceae	*Gamochaeta purpurea*	Purple Cudweed	*	
Brassicaeae	*Brassica rapa*	Field Mustard	*	
Chenopodiaceae	*Einadia hastata*	Berry Saltbush		
Chenopodiaceae	*Einadia polygonoides*			
Commelinaceae	*Tradescantia fluminensis*	Trad	*	
Commelinaceae	*Commelina cyanea*	Scurvy Weed		
Convolvulaceae	*Dichondra repens*	Kidney Weed		
Convolvulaceae	*Ipomoea indica*	Morning Glory	*	
Crassulaceae	*Bryophyllum delagoense*	Mother-of-millions	*	
Crassulaceae	*Crassula sarmentosa* var. *sarmentosa*		*	
Cupressaceae	*Cupressus sempervirens*	Mediterranean Cypress	*	
Cyperaceae	*Cyperus gracilis*			
Fabaceae (Faboideae)	*Erythina x sykesii*	Coral Tree	*	
Fabaceae (Faboideae)	*Desmodium varians*	Slender Tick-trefoil		
Fabaceae (faboideae)	*Lotus subbiflorus*		*	
Fabaceae (faboideae)	*Senna pendula* var. *glabrata*		*	
Fabaceae (faboideae)	*Trifolium repens*	White Cleaver	*	
Fabaceae (Mimosoideae)	*Acacia decurrens*	Black Wattle		

Geraniaceae	*Pellargonium* sp.		*	
Iridaceae	*Herbertia lahue* subsp. *Caerulea*		*	
Juncaceae	*Juncus usitatus*			
Lomadraceae	*Lomandra filiformis*			
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush		
Lomariopsidaceae	*Nephrolepis cordifolia*	Fishbone Fern	*	
Loranthaceae	*Amyema miquelii*	Box Mistletoe		
Malvaceae	*Malva parviflora*	Small-flowered Mallow	*	
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	*	
Moraceae	*Ficus macrophylla*	Moreton Bay Fig		
Myrtaceae	*Melaleuca decora*	White Feather Honeymyrtle		
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum		
Myrtaceae	*Corymbia citriodora*	Lemon-scented Gum		
Myrtaceae	*Corymbia maculata*	Spotted Gum		
Myrtaceae	*Eucalyptus microcorys*	Tallowwood		
Myrtaceae	*Eucalyptus moluccana*	Grey Box		
Myrtaceae	*Melaleuca armillaris*	Bracelet Honey Myrtle		
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush		
Oleaceae	*Ligustrum lucidum*	Broad-leaf Privet	*	
Oleaceae	*Olea europaea* ssp *africana*	African Olive	*	PW
Phormiaceae	*Dianella caerulea*	Blue Flax-lily		
Pinaceae	*Pinus radiata*	Radiata Pine	*	
Pittosporaceae	*Bursaria spinosa* subsp. *Spinosa*	Blackthorn		
Plantaginaceae	*Plantago lanceolata*	Plantain	*	
Poaceae	*Avena barbata*	Wild Oats	*	
Poaceae	*Cortaderia selloana*	Pampas Grass	*	PW
Poaceae	*Cynodon dactylon*	Common Couch		
Poaceae	*Ehrharta erecta*	Vasey Grass	*	
Poaceae	*Eragrostis curvula*	African Lovegrass	*	
Poaceae	*Pennisetum clandestinum*	Kikuyu	*	
Poaceae	*Bromus catharticus*	Prairie Grass	*	
Poaceae	*Briza subaristata*		*	
Poaceae	*Microlaena stipoides*	Weeping Grass		
Poaceae	*Themeda triandra*	Kangaroo Grass		
Poaceae	*Chloris gayana*	Rhodes Grass	*	
Poaceae	*Lolium perrene*	Perennial Ryegrass	*	
Poaceae	*Setaria parviflora*		*	
Poaceae	*Paspalum dilatatum*		*	
Poaceae	*Digitaria* sp.		*	
Poaceae	*Phalaris* sp.		*	
Poaceae	*Phyllostachys aurea*	Bamboo	*	
Polygonaceae	*Rumex crispus*	Curled Dock	*	
Polygonaceae	*Persicaria decipiens*	Slender Knotweed		
Portulacaceae	*Portulaca oleracea*	Pigweed		

Proteaceae	*Grevillea robusta*	Silky Oak		
Rhamnaceae	*Alphitonia excelsa*	Red Ash		
Rosaceae	*Rubus fruticosus*	Blackberry	*	PW, WoNS
Solanaceae	*Solanum linnaeanum*	Apple of Sodom	*	
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	*	
Solanaceae	*Lycium ferocissimum*	African Boxthorn	*	PW, WoNS
Solanaceae	*Solanum mauritianum*	Wild Tobacco	*	
Urticaceae	*Parietaria judaica*	Asthma Weed	*	
Verbenaceae	*Lantana camara*	Lantana	*	PW, WoNS
Verbenaceae	*Verbena bonariensis*	Purple Tops	*	

Table 9: Fauna species recorded within the study area

Class	Family	Scientific Name	Common Name	Observation Type
Aves	Corvidae	*Corvus coronoides*	Australian Raven	Observed and heard
	Maluridae	*Malurus cyaneus*	Superb Fairy-wren	Observed and heard
	Meliphagidae	*Manorina melanocephala*	Noisy Miner	Observed and heard
	Meliphagidae	*Anthochaera chrysoptera*	Little Wattlebird	Heard
	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	Observed and heard
	Psittaculidae	*Trichoglossus moluccanus*	Rainbow Lorikeet	Observed
Reptilia	Scincidae	*Lampropholis delicata*	Grass Skink	Observed

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