LOGOS WAREHOUSE FACILITY, PRESTONS

Proposed Modification to Consent (SSD 7155) - MOD 6
Biodiversity Development Assessment Report

Prepared for:

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Logos Australia Group Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
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EXECUTIVE SUMMARY

SLR was engaged by Logos Australia Group to prepare a Biodiversity Development Assessment Report in accordance the NSW Biodiversity Assessment Method (BAM) for the proposed MOD 6 application for extension of the existing Toll Warehouse 5 development on Kurrajong Road, Prestons. This project is deemed to be state significant development and therefore the project will be determined under Part 4 (Division 4.1) of the NSW *Environmental Planning and Assessment Act 1979*.

The assessment reveals that the proposed development will require the removal of native vegetation and habitat for several common species of flora and fauna species. The development will also require the removal of vegetation that is listed as critically endangered under the NSW *Biodiversity Conservation Act 2016* (BC Act).

One native plant community, *PCT 849 Grey Box-Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*, was recorded and approximately 0.15 hectares mapped within the southern parts of the site. The remaining majority (1.88 hectares) of the site comprises a mix of cleared and disturbed land and non-native and native groundcover vegetation, with occasional emergent shrubs, planted trees and weeds. Two vegetation zones have been mapped and assessed (with plot data collected by an accredited assessor) according to the BAM within the site to reflect these two distinct areas. The grassy woodland zone is in moderate to good condition and attracts a vegetation integrity score of 34.6. The cleared and disturbed zone is in low condition and attracts a vegetation integrity score of 13.6. A selection of common and widespread native plants and animals has been recorded on the site, confined largely to the patch of Grey Box-Forest Red Gum grassy woodland. No threatened species have been recorded within the Project Site.

One threatened ecological community, Cumberland Plain Woodland, which is listed as critically endangered under the BC Act, was identified within the Project Site. The proposal will require the removal of 0.15 hectares of the community. The vegetation does not meet the definition of *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Construction and operation of the proposed development will require the removal of all vegetation from the site. This impact has been assessed in accordance with the BAM, resulting in an offset requirement of three ecosystem credits for PCT 849. No species credits are required. At the time of writing, the offset obligation will require the purchase and retirement of three ecosystem credits or payment of $76,637.44 (ex GST) into the Biodiversity Conservation Fund.

No impact avoidance measures are possible for the proposed development. Mitigation measures have been presented to reduce the potential for indirect impacts on biodiversity values adjacent or downstream of the Project Site.

The proposed development is not likely to have a significant impact on any matters of national environmental significance listed under the EPBC Act.

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1 Introduction

This section introduces the proposal and provides the context of the Biodiversity Development Assessment Report (BDAR). The proposal, landscape context, key features of the Project Site and report objectives are detailed below.

1.1 The Project Site

The site (hereafter referred to as the 'Project Site') is known as Lot B DP 416483 and is located at 42B Kurrajong Road, Prestons, Sydney (see **Figure 1**). The Project Site is 2.03 hectares in area and is positioned within the Liverpool Local Government Area (LGA). The Project Site occurs on the northern side of Kurrajong Road and is surrounded by industrial development (see **Figure 2**).

1.2 The Project

The proposed development (comprising modification 6, or 'MOD 6') is essentially an expansion of the existing 'Warehouse 5' facility that currently exists on the adjoining site to the east. The expanded Warehouse 5 will continue to operate as a 'warehouse and distribution centre' as it involves the expansion of the existing Toll distribution facility. Goods generally include fast moving consumer goods. No manufacturing will take place on site. The proposed Warehouse 5 will operate for 24 hours a day, seven days a week.

The MOD 6 application seeks to modify State Significant Development (SSD) project application SSD 7155, as follows:

- Incorporating Lot B DP 416483 (herein referred to as the 'Project Site') to the description of land in SSD 7155.
- Increasing the overall site area to 26.8 hectares.
- Construction and operation of an expanded Warehouse 5 onto the Project Site with the following components:
  - 14,000 m^2 of warehouse floor space.
  - 806 m^2 of ancillary office space including open plan office area, meeting rooms, lunch room, lockers and amenities.
  - A building that is 13.7 metres in height, measuring from the finished floor to the roof ridge line.
  - Existing Warehouse 5 western wall that will be maintained with a single connection point in the north of the building.
- Truck access from Wulbanga Street and private vehicle access from Kurrajong Road.
- Relocation of the approved fire access track from the western boundary of Lot 43 to the northern boundary of Lot B; this facilitates fire truck access to Wulbanga Street which connects directly to Kookaburra Road.
- 70 car parking spaces, including one disabled space at the southern end of the warehouse.
- Recessed loading dock, hardstand area, landscaped site edge to Kurrajong Road with 1.8 metre high black palisade fencing and gates to match existing fencing.

- Provision of stormwater drainage infrastructure.
- Hours of operation for Warehouse 5 remain as approved, 24 hours a day, seven days a week.
- Administrative wording changes to the conditions of consent, including how the land is described in SSD 7155.

Further details on the proposed modification are provided in the Environmental Assessment Report (Urbis 2018). The layout of the proposed development is presented in **Figure 3**.

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Project Site and Locality

FIGURE 1

Data source: NearMap (11 September, 2018)

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Aerial Image of the Project Site

FIGURE 2

1.3 Report Objectives

This BDAR has been prepared in accordance the NSW *Biodiversity Assessment Method* ('BAM'; OEH 2017c) and aims to:

- Describe the biodiversity values, as defined under the NSW *Biodiversity Conservation Act 2016* (BC Act), of the Project Site;
- To assess potential impacts of the proposal on biodiversity values, including prescribed impacts and serious and irreversible impacts (SAIIs), in terms of biodiversity credits (i.e. ecosystem credits and species credits) as per the BAM Ancillary Rules (OEH 2017b);
- Recommend mitigation and environmental management measures to avoid and/or minimise adverse impacts on biodiversity values; and
- Determine whether a biodiversity offset is required for project approval, as per the requirements of the BAM.

1.4 Key Acts and Policies

1.4.1 NSW Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) forms the legal and policy platform for proposal assessment and approval in NSW and aims to '*encourage the proper management, development and conservation of natural and artificial resources'*. All development in NSW is assessed in accordance with the provisions of the EP&A Act and EP&A Regulation 2000.

This project is deemed to be 'State Significant Development' by virtue of *State Environmental Planning Policy (State and Regional Development) 2011* and pursuant to Division 4.7 of the NSW EP&A Act.

1.4.2 NSW Biodiversity Conservation Act 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act), the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation) and amendments to the NSW *Local Land Services Act 2013* (LLS Act) commenced on 25 August 2017. The BC Act repealed several pre-existing Acts, most notably the NSW *Threatened Species Conservation Act 1995*, the NSW *Nature Conservation Trust Act 2001* and the NSW *Native Vegetation Act 2003*. Relevant provisions from each of the repealed Acts has been saved and incorporated into the new legislative framework. Transitional arrangements are in place to ensure a smooth transition from the repealed legislation to the BC Act.

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Note: Building layout extent is approximate.

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Proposed Development Footprint

FIGURE 3

In accordance with the BC Act, the BAM (OEH 2017c) and entry into the Biodiversity Offsets Scheme (BOS) is applicable to certain development activities based on specific criteria. Preparation of a Biodiversity Development Assessment Report (BDAR) is required for a development application that meets any of the following criteria:

- Part 4 development activities deemed to be 'State Significant' under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act);
- Development activities that have the potential to impact Areas of Outstanding Biodiversity Value (AOBV) as listed under Part 3 of the BC Act;
- Local developments that have the potential to cause a significant impact on a threatened species, population or ecological community, listed under Schedules 1 and 2 of the BC Act, as determined by application of a five-part-test of significance in accordance with Section 7.3 of the BC Act;
- Development activities that have the potential to impact areas mapped as having 'high biodiversity value' as indicated by the NSW Biodiversity Values Map (BV Map); and
- Development activities that involve clearing of native vegetation that exceeds the Biodiversity Offset Scheme thresholds (BOS thresholds) as determined by the BC Regulation.

1.4.3 NSW Biodiversity Values Map

A review of the BV Map (at the time of writing) indicates that the Project Site is not mapped as containing any areas of 'high biodiversity value'. The nearest areas of land mapped in the BV Map are located several hundred metres to the north.

1.4.4 NSW Biosecurity Act 2015

The NSW *Biosecurity Act 2015* provides a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds. The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

1.4.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* aims to conserve nature, objects, places or features (including biological diversity) of cultural value within the landscape. The Act also aims to foster public appreciation, understanding and enjoyment of nature and cultural heritage, and provides for the preservation and management of national parks, historic sites and certain other areas identified under the Act. The Act is administered by the NSW Office of Environment and Heritage (OEH).

No areas of National Park estate occur within or adjacent to the Project Site. An assessment of the proposal in relation to impacts on native flora and fauna; with an emphasis on threatened species and habitat, is undertaken in **Section 4.**

1.4.6 NSW Water Management Act

Controlled activities carried out in, on or under waterfront land are regulated by the NSW *Water Management Act 2000* (WM Act). The NSW Department of Industry Water administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary. This means that a controlled activity approval must be obtained from the Department of Industry - Water before commencing the controlled activity.

No mapped waterways occur within or near the Project Site; therefore, the proposal is not a controlled activity and approval is not required under the WM Act. An assessment of indirect impacts of the proposal, such as the effects of sedimentation during construction activities, is undertaken in **Section 4.** Mitigation measures to reduce these effects are presented in **Section 4.7.**

1.4.7 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on 'matters of national environmental significance' undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Minister for the Environment.

The EPBC Act identifies matters of NES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar Wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

As part of the current investigation, matters of national environmental significance (and their habitats) that are predicted to occur within the locality (applying a 10 kilometre buffer) were obtained from the on-line Protected Matters Search Tool (DEE 2018a). These records are discussed in **Section 2.4**. The EPBC Act has been further addressed in this assessment through:

- Targeted field surveys for EPBC listed threatened biota and migratory species;
- Assessment of potential impacts on EPBC listed threatened species and migratory biota;

- Identification of suitable impact mitigation and environmental management measures for EPBC listed threatened species and migratory biota; and
- Identification of the need for an EPBC referral through reference to the EPBC Act *Significant Impact Guidelines 1.1* (DEWHA 2013).

1.4.8 State Environmental Planning Policy No. 44- Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage the "*proper conservation and management of areas of natural vegetation that provide habitat for Koalas Phascolarctos cinereus to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline*". Whilst a new version of SEPP 44 is currently being prepared, this version was not available at the time of preparation of this report and therefore the current SEPP 44 has been considered for this BDAR.

SEPP 44 applies to development applications pertaining to sites greater than one hectare within local government areas listed under Schedule 1 of the policy. As Liverpool LGA is listed under Schedule 1 of the policy and the Project Site is greater than one hectare, SEPP 44 could potentially apply to the proposed development at Prestons.

Potential koala habitat are areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component. The site contains just one species of tree, the Grey Gum *Eucalyptus punctata*, which is listed in Schedule 2. However, only one individual of this species was recorded on the site (outside of the patch of native vegetation and amongst exotic groundcover vegetation) and therefore does not constitute 15 per cent of the total number of trees. Therefore, the Project Site does not qualify as potential koala habitat and SEPP 44 does not apply.

1.4.9 Local Environmental Planning Instruments

Local Environmental Plans (LEPs) are legal environmental planning instruments that guide planning decisions for LGAs. They allow councils to provide guidelines and controls for the use and development of land through zoning and development consents.

The Project Site is located within the Liverpool Local Government Area (LGA) and the applicable local planning instrument is the *Liverpool Local Environmental Plan 2008* (LEP). As an SSD project, however, there are no specific requirements of the LEP that apply to this BDAR.

2 Methodology

This chapter described the methods undertaken to identify biodiversity values within the Project Site in accordance with Stage 1 of the BAM.

2.1 Personnel

SLR Ecology currently holds a NSW National Parks and Wildlife Services and NSW Office of Environment and Heritage Scientific Licence (licence number SL100176), as well as a Department of Primary Industries Animal Ethics Approval, which authorises field staff to trap, capture, harm, hold and release animals protected under the BC Act. The roles and qualifications of all staff responsible for preparation of this BDAR are listed in **Table 1**.

Table 1 Staff Roles and Qualifications

Staff Name & Title	Qualifications	Role
Jeremy Pepper Principal Ecologist	Bachelor of Science (Hons Class 1) University of NSW 1996 Cert II Bushland Regeneration, TAFE NSW Cert III Horticulture (Arboriculture), TAFE NSW BAM accredited assessor (#BAAS17104)	Project development, field assessment, report preparation
Gilbert Whyte Associate Ecologist	Doctor of Philosophy (PhD), Murdoch University (Perth WA) Bachelor of Biological Sciences (1st Class Honours) La Trobe University, (Melbourne Vic) BAM accredited assessor (#BAAS18041)	Project management, field assessment, data technical review
Fiona Iolini Senior Ecologist	Bachelor of Environmental Science and Management, University of Newcastle 2007 Certificate of Native Plant Identification, Sydney University 2008 Cert III Conservation and Land Management, TAFE NSW 2015 BAM Training 2018 (accreditation pending approval)	Quality assurance report review
Emily Mitchell CAD/GIS Technical Officer	Bachelor of Development Studies (2008 – University of Newcastle) Cert IV Spatial Information Services, TAFE NSW	GIS data management and figure preparation

2.2 Information Sources

Existing information on the flora and fauna of the Project Site and the locality, including relevant threatened biota was also obtained from:

- Regional vegetation mapping: *The Native Vegetation of the Sydney Metropolitan Area* – Version 3.0 (OEH 2016b);
- The NSW Office of Environment and Heritage (2018a) *BioNet Atlas of NSW* for previous records of threatened species, populations and ecological communities (as listed under the BC Act) within a five kilometre radius centred on the centre of the Project Site

- The Department of the Environment and Energy (DEE 2018a) *Protected Matters Search Tool*, which involved a search for matters of national environmental significance within a 10-kilometre radius centred on the centre of the site;
- Department of the Environment and Energy (DEE 2018b). *Species Profile and Threats Database* (SPRAT);
- The NSW Office of Environment and Heritage (OEH 2018c) *Threatened Species* Profiles; and
- Relevant published literature on threatened biota (see References).

The results of the database searches were used to compile a list of threatened species, populations and communities (i.e. listed under the BC Act and EPBC Act) that could potentially occur within the Project Site. A likelihood of occurrence of these species is presented in **Appendix A**.

2.3 Field Assessment

The field assessment was undertaken by SLR Associate Ecologist, Gilbert Whyte on the 25th July 2018 and Principal Ecologist, Jeremy Pepper on the November 2018. Methods utilised during the field surveys are described in the following sections. The assessment was undertaken in accordance with the Biodiversity Assessment Method (OEH 2017c) and with reference to the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC 2004). Limitations of the surveys are discussed in **Section 2.5.3**.

2.3.1 Vegetation type mapping (Identifying PCTs)

Plant community types (PCTs) were identified based on site data collected via plot/transects (see below), supplemented with random meanders, for dominant flora species present within each structural layer (i.e. canopy, shrub and ground layers), and comparison to descriptions of PCTs in the BioNet Vegetation Classification. Non-native (exotic), disturbed land or highly modified native vegetation was identified based on structure and species composition. Boundaries of PCTs were marked on an aerial image of the site and later digitised using geographical information system (GIS) software.

Identification of threatened ecological communities, as listed under the BC Act, was completed for each PCT through comparison of site floristic data, landscape position, soil landscape, geology and local government area against identification criteria listed in the Final Determination of the NSW Scientific Committee for relevant threatened communities, as well as online threatened community profiles published by OEH.

2.3.2 Mapping vegetation zones

The vegetation condition of each PCT was defined as 'moderate to good', or 'low' based on the definitions presented in **Table 2.** Vegetation condition was then used to delineate vegetation zones as per Section 5.3.1 of the BAM (OEH 2017c).

Table 2 Vegetation Condition Definitions

Vegetation Condition	Definition[#]
Moderate - Good	Vegetation retaining the species complement and structural characteristics of the pre-European equivalent. Vegetation retaining a native canopy and has a native understorey of greater than 50% cover. This condition class can include derived native grasslands and can have minor weed incursions with some patches being subject to grazing.

Low	Vegetation within which the understorey is generally dominated by exotic species being greater than 50% exotic cover, with canopy absent or canopy foliage cover below benchmark. The shrub layer is generally absent and weed invasion is generally significant.

Note: vegetation condition classes are not defined in the BAM

2.3.3 Vegetation Integrity Survey Plots

Following delineation of vegetation zones within the Project Site, a plot-based floristic vegetation survey was conducted by the author (Accredited Assessor J Pepper). Two 20 m X 50 m (1000 m²) plot/transects ('BAM plots') were sampled, one in each zone, each containing a nested 20 m X 20 floristic plot. Plot/ transects were positioned randomly to sample areas that were most representative of the floristic characteristics of each vegetation zone. The number of plot/transects sampled in each vegetation zone was based on the requirements of the BAM (OEH 2017c), which are presented in **Table 3.**

Table 3 BAM plots required and completed per vegetation zone

Zone	Zone Name	Zone Area (ha)	BAM category[#]	Minimum plots/transects (BAM)	Plots Completed
Zone 1	PCT 849 Mod-good	0.15 ha	<2 ha	1 plot/transect	1
Zone 2	PCT 849 Low	1.88 ha	<2 ha	1 plot/transect	1

Based on Table 4 in the BAM (OEH 2017c)

Vegetation integrity was determined using data collected from vegetation survey plot/ transects (BAM Plots) by examining the vegetation composition, structure and function attributes as follows:

- The assessment of vegetation composition was based on the number of native plant species (richness) observed within the 400 m² plot/transect (standard 20m x 20m BAM Plot);
- The assessment of vegetation structure was based on the % of foliage cover for each plant growth form group within the 400 m² plot (standard 20m x 20m BAM plot); and
- The assessment of vegetation function was based on an assessment of the following attributes within the 1000 m² plot (20 m x 50 m BAM Plot):
  - Number of large trees
  - Tree regeneration
  - Tree stem size class
  - Total length of fallen logs
  - Litter cover (i.e. assessed using five 1 m² quadrats along the 50 m transect)
  - High threat exotic vegetation cover
  - Hollow bearing trees

For a more detailed description of how vegetation integrity was calculated, refer to the BAM (OEH 2017c).

2.3.4 Threatened Flora Surveys

Targeted threatened flora surveys were conducted in accordance with the *NSW Guide to Surveying Threatened Plants* (OEH 2016a) for species identified during the desktop review and BAM assessment. Two surveys were conducted: one day in July, as part of the preliminary investigation, and one day in November 2018, as part of the current BAM assessment.

Surveys consisted of a random meander followed by parallel field traverses (i.e. 10MB apart) in suitable habitats. This methodology is consistent with the survey effort required to adequately detect threatened herb, shrubs and trees in woodland habitat.

For the current assessment, targeted threatened flora surveys were conducted for candidate species credit species, as discussed in **Section 3.4.4.** Threatened flora species identified as requiring targeted surveys were determined based on previous records and habitat suitability, in accordance with Section 6.4 of the BAM (OEH 2017c). Species that were targeted all had a low likelihood of occurrence within the Project Site due to habitat fragmentation and a general lack of available habitat. Surveys included targeted searches for the following threatened plant species:

- *Acacia pubescens* (Downy Wattle);
- *Caladenia tessellata* (Thick-lipped Spider-orchid);
- *Dillwynia tenuifolia*;
- *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea)
- *Pimelea spicata* (Spiked Rice-flower); and
- *Pultenaea pedunculata* (Matted Bush-pea).

A likelihood of occurrence assessment for these species is presented in **Appendix A**.

2.3.5 Plant Identification and Nomenclature

Plant identification and nomenclature was based on species descriptions presented within *The Flora of New South Wales* Volumes 1 to 4 (Harden, 1990 - 2003 and the taxonomic updates in PlantNET - The NSW Plant Information Network System of Royal Botanic Gardens and Domain Trust, Sydney (RBGDT 2018).

2.3.6 Fauna Surveys

Opportunistic and incidental observations of fauna species were recorded at all times during field surveys. These included opportunistic observation of fauna activity such as scats, tracks, burrows or other traces. Given the minor scale of the development, no specific survey methods were used to target threatened fauna species. For example, no AnaBat analysis, call playback or trapping of fauna species was conducted. Further justification for the limited survey effort is presented in **Section 2.5.3**.

A likelihood of occurrence assessment for threatened fauna species is presented in **Appendix A**.

2.3.7 Fauna Habitat Assessment

The locations of any important habitat features, such as microbat roosting habitat, hollow-bearing trees and nests/burrows were captured with a handheld GPS unit and photographed where appropriate.

Searches for potential habitat for threatened fauna species included but were not limited to:

- Koala feed trees;
- Foraging trees for threatened arboreal fauna;
- Hollow-bearing trees;
- Potential roosts for microchiropteran bats; and
- Terrestrial refugia such as woody debris and logs.

2.4 Likelihood of occurrence

Following collation of database records and species and community profiles, a 'likelihood of occurrence' assessment was prepared with reference to the broad habitats contained within the Project Site. The likelihood of threatened species occurring in the Project Site was assessed based on presence of records from the locality, species distribution and habitat preferences, and the quality of potential habitat present, as defined in **Table 4**.

Table 4 Key to Likelihood of Occurrence for Threatened Species

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

2.5 Biodiversity Credit Calculations

2.5.1 Biodiversity Credit Calculations

Biodiversity credits required to offset impacts of the proposal were calculated using the BAM Calculator[1] in accordance with the Biodiversity Offsets Scheme. These calculations were performed by SLR Principal Ecologist Jeremy Pepper (BAM Accredited Assessor - BAAS17104) in November 2018.

2.5.2 Ecosystem Credit Species and Candidate Threatened Species

A discussion of 'ecosystem credit species' and 'candidate threatened species' (i.e. species credit species) as returned by the BAM (OEH 2017c) is presented in **Section 3.4.** The section states the recommended survey period for detecting each species, whether each species was detected during the field survey and whether the proposal is likely to impact each species (i.e. based on habitat suitability). Although surveys did not coincide with the detectability of all of these species, the BAM states '*that a candidate threatened will be considered unlikely to occur on the Project Site if after carrying out a field assessment of the habitat constraints or microhabitats on the subject land, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land*'. It has been determined that targeted surveys for most of the listed candidate threatened species are not required for the current assessment due to a lack of habitat present within the Project Site or due to a lack of foreseeable impacts due to avoidance and mitigation measures as detailed in **Section 4**.

For a more detailed description of how biodiversity credits are calculated, refer to the BAM (OEH 2017c).

2.5.3 Survey Limitations and Assumptions

The Project Site occurs within a modified environment, consisting of surrounding industrial and residential areas. Ecological features were generally restricted to a small area of mature trees and expanses of cleared and modified land containing weeds and common native ground cover species.

Given the minor scale of direct impacts associated with the proposed development (i.e. minimal vegetation removal), the current ecological survey was designed to provide an overall assessment of the ecological values within the Project Site. Given the duration and timing of the field survey, it is likely that some of the species that may occur within the Project Site (i.e. permanently, seasonally or transiently) were not detected during the survey. It was beyond the scope of the survey to carry out detailed fauna surveys such as fauna trapping, however, a detailed habitat assessment was conducted to inform the 'likelihood of occurrence' of threatened species known or predicted to occur within the locality.

Site conditions (including the presence of threatened species of flora and/or fauna) may change after the date of this report. SLR does not accept responsibility arising from, or in connection with, any change to the site conditions. SLR is also not responsible for updating this report if the site conditions change.

[1] App last updated: 19/07/2018 (Version: 1.2.5.00); BAM data last updated: 7/11/2018 (Version: 4).

3 Stage 1 - Biodiversity Assessment

This chapter describes the biodiversity values of the site and landscape context, in accordance with Stage 1 of the BAM.

3.1 Landscape Features

3.1.1 Overview

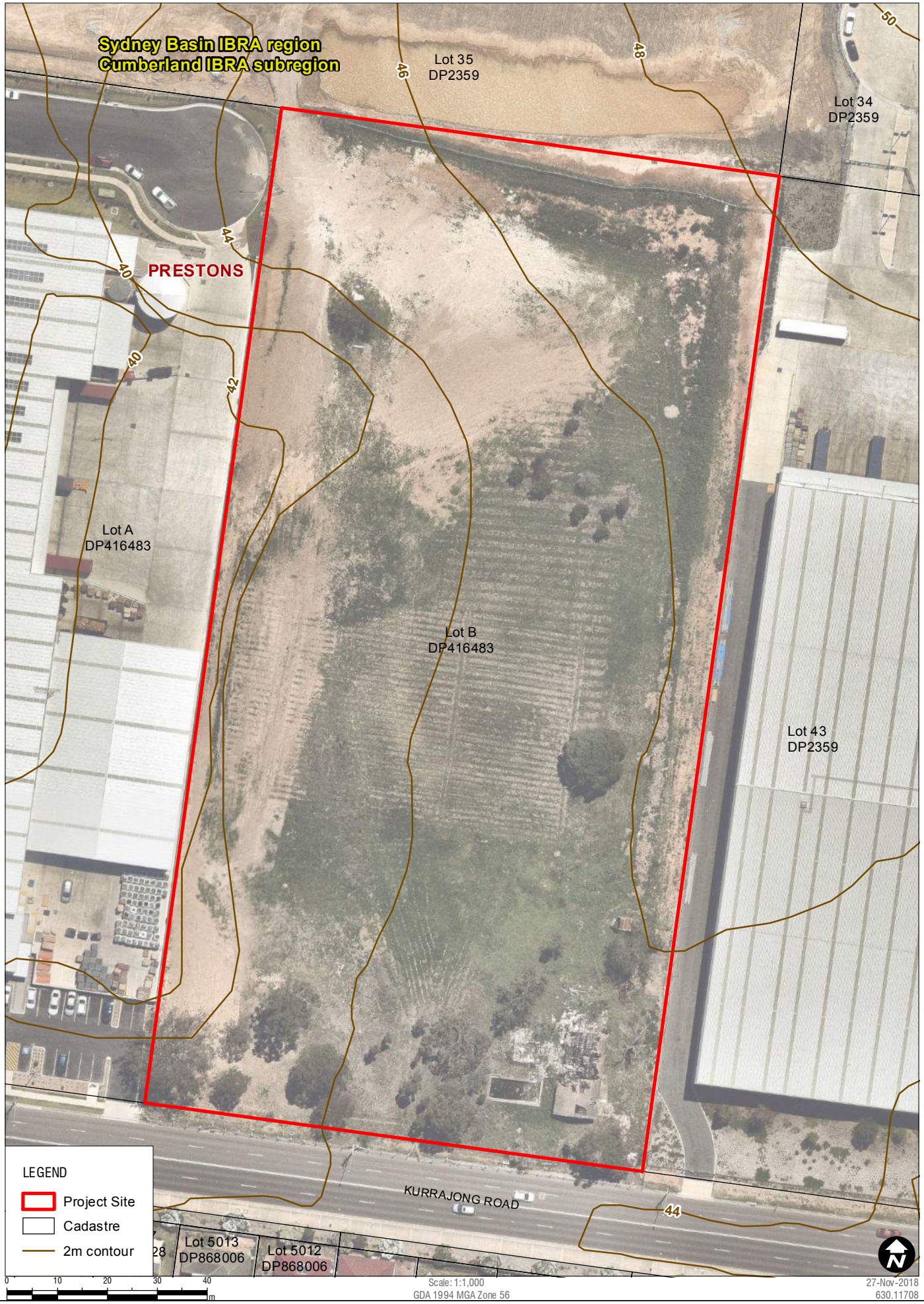
Chapter 4 of the BAM (Section 4.2.1.3) requires landscape features to be described in the BDAR and shown on the Site Map and the Location Map, as follows:

- IBRA bioregions and IBRA subregions;
- rivers, streams and estuaries (classified according to stream order and including riparian buffers);
- important and local wetlands on, adjacent and downstream of the site;
- habitat connectivity identifying the area/s of connectivity joining different areas of habitat that intersect with the subject land and the areas of habitat that are connected;
- karst, caves, crevices, cliffs and areas of geological significance;
- areas of outstanding biodiversity value that have been identified under the BC Act; and
- additional features required to be assessed by the Secretary's Environmental Assessment Requirements (SEARs) for a major project.

Landscape features, as applicable to the Project Site at Prestons, are summarised in **Table 5** and shown in the Site Map (**Figure 4**) and the Location Map (**Figure 5**). Further details regarding landscape features are provided in the following sub-sections.

Table 5 Landscape Features and Information

Landscape Feature	Name and Comment	Section in BDAR
IBRA Region	Sydney Basin	3.1.1
IBRA Sub Region	Cumberland	3.1.1
NSW (Mitchell) Landscape	Cumberland Plain	3.1.1
Native vegetation extent	Present on site and in buffer area (11 %)	3.1.2
Cleared areas	Present in parts of the site and in buffer	3.2
Rivers, streams and estuaries	None	3.1.3
Important and local wetlands	None	3.1.4
Habitat connectivity	Negligible or zero	3.1.5
Karst, caves, crevices, cliffs and areas of geological significance	None	3.1.6
Areas of outstanding biodiversity value	None	3.1.6
Additional features in SEARs	None	3.1.6



Data source: Interim Biogeographic Regionalisation for Australia (Subregions - States and Territories) v.7 (Department of Environment, 2012)

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Site Map

FIGURE 4

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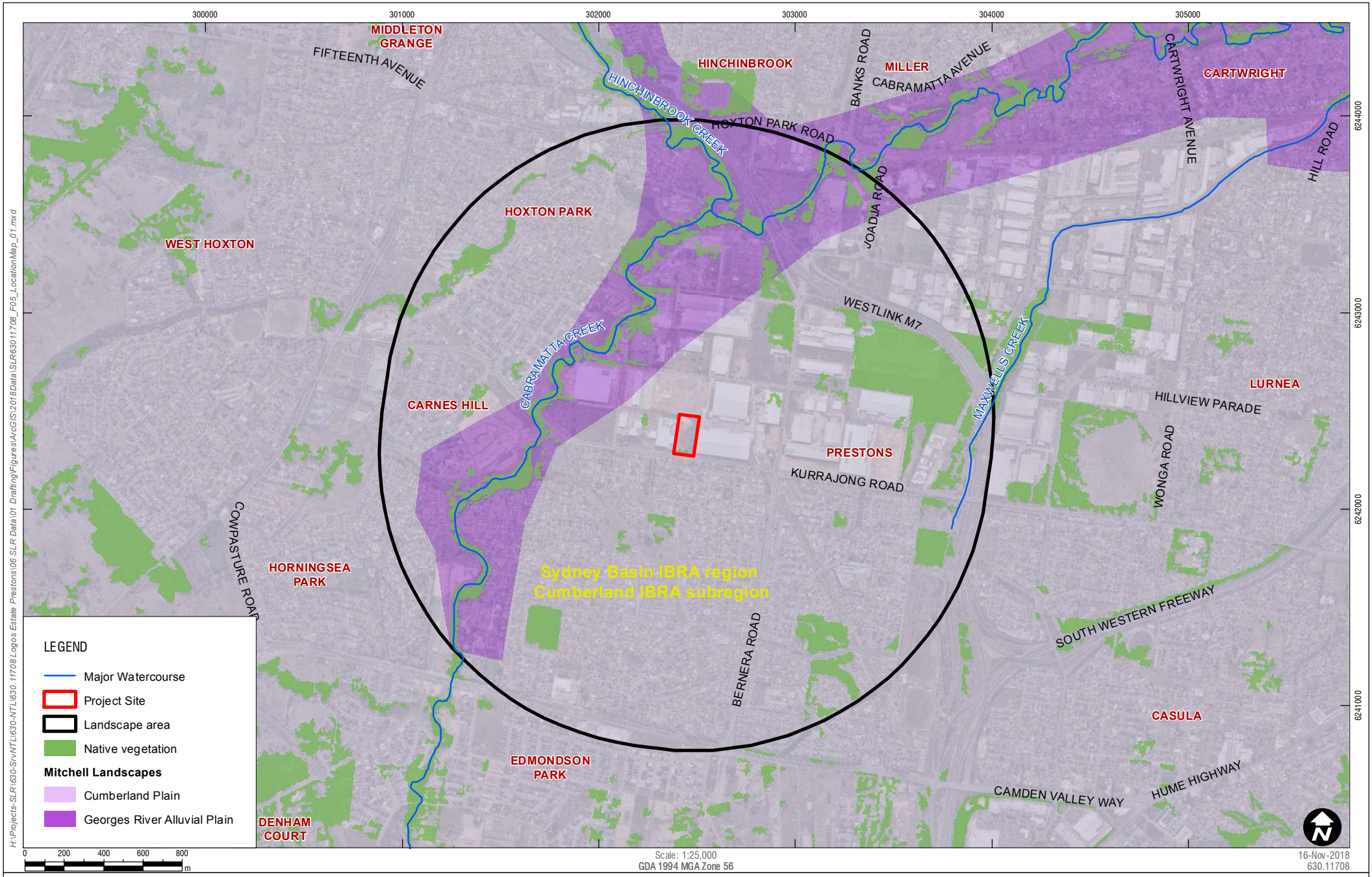

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Scale: 1:25,000
GDA 1994 MGA Zone 56

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Data source: The Native Vegetation of the Sydney Metropolitan Area, version 3 (OEH, 2016)
NSW (Mitchell) Landscapes v.3.1 (OEH, 2008)
Interim Biogeographic Regionalisation for Australia (Subregions - States and Territories) v.7 (Department of Environment, 2012)

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Location Map

FIGURE 5

3.1.2 Native Vegetation Extent

Vegetation clearing has occurred within the Project Site and within the wider landscape (1500 m) buffer, mainly for urban development. Native vegetation in the locality consists mainly of street trees along roadways and small patches of forest in reserves such as the Dalmeny Reserve to the south and surrounding recreational parks to the west such as Harvard Park, as well as riparian vegetation lining Cabramatta Creek, which lies to the west and northwest of the site.

The native vegetation within the Project Site consists of a small patch of residual grassy woodland, with the majority of the site (~93 %) comprising either non-native vegetation or cleared and disturbed land. The Project Site totals 2.03 ha and contains approximately 0.15 ha of native vegetation and 1.88 ha of non-native vegetation /disturbed land.

According to regional scale vegetation mapping by OEH (2016b), the extent of native vegetation within the 1500 m buffer and the site, which comprises a total area of 801 ha, is 88 ha. Accordingly, the native vegetation cover in the landscape context, is approximately 11 %; this percent cover value has been entered into the BAM Calculator and corresponds to the cover class of >10-30 % cover. The extent of native vegetation cover in the landscape buffer is shown in the Location Map (**Figure 5**) and a breakdown of the native plant communities mapped within the landscape buffer is listed below in **Table 6**.

Table 6 Native plant communities with the landscape buffer

Vegetation Type[#]	PCT Code	Area (ha)
S_DSF02: Castlereagh Shale-Gravel Transition Forest	724	20
S_DSF01: Castlereagh Ironbark Forest	725	13
S_FrW03: Coastal Freshwater Wetland	781	2
S_FoW06: Cumberland Riverflat Forest	835	15
S_GW03: Cumberland Shale Plains Woodland	849	14
S_FoW07: Cumberland Swamp Oak Riparian Forest	1800	24
	Total	**88**

Source: OEH (2016b)

3.1.3 Rivers and Streams

No mapped waterways occur within or adjacent to the Project Site. The nearest waterway consists of a first order stream that lies approximately 350 m to the west and runs via a farm dam and through street drainage north to Cabramatta Creek, which lies 500 northwest of the site at it closest point.

3.1.4 Wetlands

No wetlands occur within, adjacent to, or downstream of the Project Site. The nearest wetland consists (or consisted) of a farm dam located to the west of Kookaburra Road, around 500 west of the site boundary, although recent aerial imagery by SixMaps (NSW Government Spatial Services, 2018) indicates that this dam has been drained.

3.1.5 Connectivity Features

The Project Site is surrounded by recently constructed industrial buildings and associated ancillary works and infrastructure on the adjoining lots bounded by Kurrajong Road, Bernera Road, Yarrunga Street and Kookaburra Road (see **Figure 1**). Small patches of woodland vegetation and exotic pasture that existed on adjacent lots up until recently have all been removed as part of recent developments. The small patch of grassy woodland remaining in the southern parts of the Project Site is surrounded by buildings to the west, north and east, and Kurrajong Road to the south.

Native vegetation is restricted to a small modified patch near the southern boundary. The woody vegetation consists of isolated mature native and exotic tree species. Native trees occur which are likely to be remnants of the natural vegetation that once occurred in the area. Many of the trees in the southeastern portion of the site are planted.

The nearest native vegetation in moderate to good condition (or high vegetation integrity) would be the linear stands of Swamp Oak forest lining Cabramatta Creek, approximately 500 m northwest of the Project Site. No high integrity vegetation occurs within or directly adjacent to the Project Site.

3.1.6 Other Notable Landscape Features

The Project Site contains no other notable landscape features relevant to this assessment. These include those listed below:

- Wetlands (including important wetlands) – there are no wetlands within or adjacent to the site;
- Areas of geological significance and soil hazard features;
- Karst, caves, crevices, cliffs or areas of geological significance;
- Areas of Outstanding Biodiversity Value (AOBV) as listed under the BC Act; and
- Additional features identified in the SEARs.

3.2 Native Vegetation

3.2.1 Native Plant Species

A total of 64 plant species have been identified within the Project Site during the current and previous field assessments. These comprise 34 exotic species and 30 native species. Seven of the native species appear to have been planted as ornamentals. A complete list of all plant species observed on the site is presented in **Appendix B**.

Plant species comprised the following plant groups:

- 28 forbs (8 natives);
- 13 grasses (4 natives);
- 8 shrubs (2 natives);
- 12 trees (11 natives);
- two sedges (two natives); and
- one climber.

For vegetation zone 1 (PCT 849 Mod-good) the following plant types were recorded with in 400 square meter plot and entered in the BAM Calculator:

- 3 native trees;
- 0 shrubs;
- 5 native grasses;
- 6 native forbs;
- 0 ferns; and
- 0 other.

All BAM Plot/ Transect data is presented in **Appendix C**.

3.2.2 Weeds and High Threat Exotics

Of the exotic plant species identified during the assessment, 11 are identified as High Threat Exotics (HTEs) according to the OEH High Threat Weeds List (OEH 2018d). These comprise the following species:

- *Araujia sericifera* (Moth Vine)
- *Chloris gayana (Rhodes Grass)*
- *Cenchrus clandestinum* (Kikuyu);
- *Paspalum dilatatum* (Paspalum);
- *Lycium ferocissimum (*African Boxthorn);
- *Hypericum perforatum* (St John's Wort);
- *Senecio madagascariensis* (Fireweed);
- *Bidens pilosa* (Cobblers Pegs);
- *Cotoneaster glaucophyllus* (Cotoneaster);
- *Ehrharta erecta* (Panic Veldt Grass); and
- *Ligustrum lucidum* (Large-leaf Privet).

For vegetation zone 1 (PCT 849_Mod-good) the total cover of HTEs recorded and entered in the BAM Calculator is 4.6 %. For vegetation zone 2 (PCT 849_Low) the total cover of HTEs recorded and entered in the BAM Calculator is 32 % (**Appendix C**).

3.2.3 Plant Community Types

3.2.3.1 Regional Vegetation Mapping

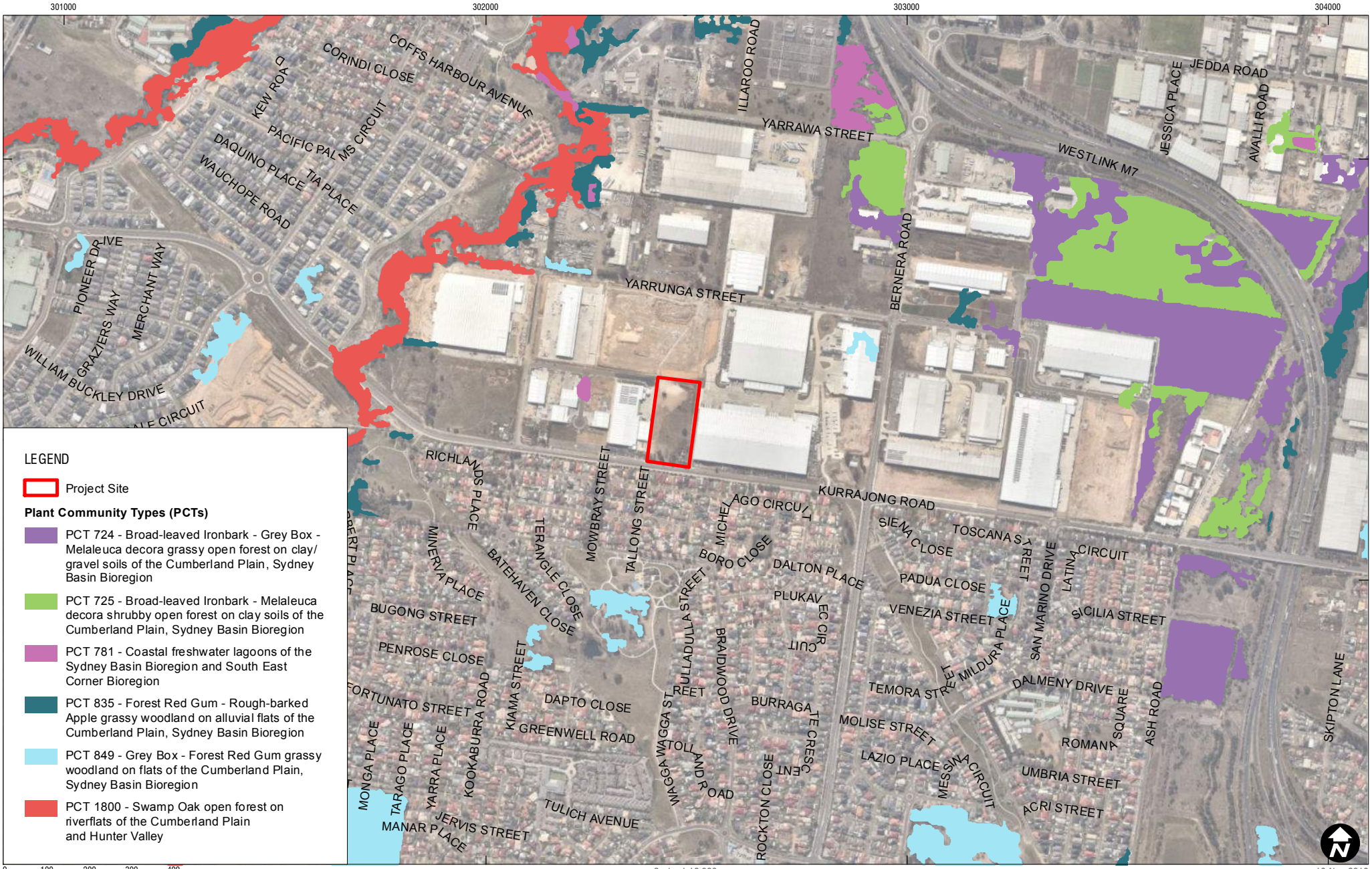
Recent regional scale vegetation mapping for the Sydney Metropolitan Area (OEH 2016b) indicates that the Project Site is not mapped as containing any native vegetation (see **Figure 6**). The field assessment confirmed that the vegetation mapping of the Sydney Metropolitan Area (OEH 2016b) is somewhat accurate, with respect to mapping the patches of native vegetation in the locality, but with respect to the mapping of the site, the small patch of woodland vegetation mapped as part of the current assessment is not mapped by OEH (2016b). This discrepancy in the mapping is not unexpected given that the OEH (2016b) mapping is produced at a much larger scale and would not have necessarily involved field verification at the Project Site.

3.2.3.2 Site Vegetation Mapping

Based on the current field survey conducted by SLR in November 2018 according to the BAM (as well as previous surveys conducted in July 2018), one native plant community was identified on the site, with other areas comprising non-native vegetation and/or disturbed land, as follows:

- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849), which is associated with Cumberland Plain Woodland, a critically endangered ecological community under both the BC Act; and
- Non-native Vegetation/Disturbed Land– mapped as a low condition form of PCT 849 for the purposes of this BDAR.

The profile of PCT 849 from the BioNet Vegetation Classification is provided in **Appendix D.** Summaries of the characteristics of each of the above two PCT zones (based on data collected from the Project Site according to the BAM) are presented in **Table 7** and **Table 8**, respectively. A revised vegetation map showing the extent of each plant community type (PCT) within the Project Site is presented in **Figure 7**.



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Scale: 1:12,000
GDA 1994 MGA Zone 56

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Data source: The Native Vegetation of the Sydney Metropolitan Area, version 3 (OEH, 2016)

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Regional Vegetation Mapping for the Sydney Metropolitan Area

FIGURE 6

Table 7 PCT 849 Grey Box - Forest Red Gum grassy woodland – community details

Vegetation Community	Floristic Structure and Composition
Vegetation Formation	KF-CH3 - Grassy Woodlands
Vegetation Class	Coastal Valley Grassy Woodlands
Regional Vegetation Mapping Equivalent	Cumberland Shale Plains Woodland
PCT Equivalent (PCT Code) (OEH 2018b)	PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849)
PCT Scientific Name (OEH 2018b)	*Eucalyptus moluccana , Eucalyptus tereticornis / Bursaria spinosa subsp. spinosa / Dichondra repens , Cheilanthes sieberi subsp. sieberi , Aristida vagans, Microlaena stipoides var. stipoides*
Conservation Status (BC Act and EPBC Act)	A Critically Endangered Ecological Community (EEC) listed under the NSW BC Act and the EPBC Act
Cleared Status (OEH 2018b)	93%
General Vegetation Structure	The community has a woodland structure with a sparse shrub layer and groundcover dominated by forbs and grasses (i.e. managed)
Floristic Composition	Open woodland areas within the Project Site dominated by the following canopy species: • *Eucalyptus moluccana* (Grey Box); and • *Corymbia maculata* (Spotted Gum). The mid-canopy and shrub layers are sparse. The groundcover is dominated by native grasses and exotic grasses and herbs including the following species: • *Aristida ramosa* (Purple Wiregrass); • *Dichondra repens* (Kidney Weed); • *Microlaena stipoides* (Early Spring Grass); • *Dichelachne micrantha*(Shorthair Plumegrass); • *Paspalum dilatatum* (Paspalum); • *Cenchrus clandestinus (*Kikuyu); • *Chloris gayana* (Rhodes Grass); and • *Plantago lanceolata* (Lamb's Tongues)
Soil Type and Geology	Silty Clay Loam over Wianamatta Shales and Sandstones
Evidence of Disturbance	Long term agriculture and recent disturbance (i.e. grazing, ploughing, clearing, residential dwelling, soil disturbance)
Plots/transects Sampled	P01

Table 8 Non-native/Disturbed Land (PCT 849_Low Condition) – community details

Vegetation Community	Floristic Structure and Composition
Vegetation Formation	KF-CH3 - Grassy Woodlands
Vegetation Class	Coastal Valley Grassy Woodlands
Regional Vegetation Mapping Equivalent	Not mapped
PCT Equivalent (PCT Code) (OEH 2018b)	PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (PCT 849)
PCT Scientific Name (OEH 2018b)	*Eucalyptus moluccana , Eucalyptus tereticornis / Bursaria spinosa subsp. spinosa / Dichondra repens , Cheilanthes sieberi subsp. sieberi , Aristida vagans, Microlaena stipoides var. stipoides*
Conservation Status (BC Act and EPBC Act)	Not listed under BC Act or EPBC Act (lacking characteristic species)
Cleared Status (OEH 2018b)	93%
General Vegetation Structure	The community has a managed grassland structure, with occasional individuals of planted or self-sown native trees
Floristic Composition	This PCT subunit is dominated by exotic grasses, herbs and forbs such as: • *Briza maxima* (Quaking Grass); • *Hypericum perforatum* (St John's Wort); • *Sonchus oleraceus* (Common Sowthistle); • *Setaria pumila*; • *Paspalum dilatatum* (Paspalum); • *Senecio madagascariensis* (Fireweed); and • *Plantago lanceolata* (Lamb's Tongues) Native groundcovers recorded in the zone include *Microlaena stipoides* (Weeping Grass), *Solanum pungetium* and *Tricoryne elatior*.
Soil Type and Geology	Silty Clay Loam over Wianamatta Shales and Sandstones
Evidence of Disturbance	Long term agriculture and recent disturbance (i.e. grazing, ploughing, clearing, residential dwelling, soil disturbance)
Plots/transects Sampled	P02

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Plant Community Types mapped within the Project Site

FIGURE 7

Plant Community Type Justifications

According to the Bionet Vegetation Classification (OEH 2018b) the woodland vegetation within the Project Site is commensurate with *PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.* The diversity and percentage coverage of native species within the Project Site was relatively low within this community as evidenced by the data collected from the BAM plots compared with benchmark values for PCT 849. This is likely to be due to the long history of agricultural and rural-residential use of the site.

Justification for the identification of *PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion* includes the following:

- The vegetation is a native plant community within the Sydney Basin Bioregion and the Cumberland Plain Subregion;
- The vegetation is commensurate with a Grassy Woodland vegetation class, as indicated by the low to moderate foliage projective cover of the canopy layer (i.e. 30-40%), low representation of small trees and shrubs and groundcover comprising mainly grass (and other non-grass) species;
- The vegetation lies adjacent to an area previously mapped as containing Shale Plains Woodland (see NPWS 2002), which aligns with PCT 849;
- The canopy of the community contains indicator species including *Eucalyptus moluccana* (Grey Box) and *Corymbia maculata* (Spotted Gum); and
- The groundcover layer is composed of native grasses and herbs characteristic of PCT 849, being a grassy woodland community endemic to western Sydney.

Biodiversity Risk Weighting

The BAM uses a biodiversity risk weighting to evaluate the ecological risks of threatened entities from the biodiversity offsets scheme. The biodiversity risk weighting is comprised of two components:

- '*Sensitivity to loss'* – this considers the increased threat posed to an entity from offsetting the loss of habitat or population, and
- '*Sensitivity to potential gain'* – this considers the ability of a species to respond to improvements in habitat condition at an offset site.

Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion is commensurate with a Critically Endangered Ecological Community listed under the BC Act. In accordance with the BAM, this community therefore has a '*very high sensitivity to loss'* and a '*High sensitivity to potential gain*'. The risk weighting for PCT 849 in the BAM Calculator is 2.5.

3.2.3.3 Vegetation Integrity Assessment (Vegetation Zones)

Mapping Vegetation Zones

The native plant community (PCT 849) recorded on the Project Site was further divided into vegetation zones based on broad condition states of 'Moderate to good' and 'Low', in accordance with Section 5.3.1 of the BAM. The distribution and extent of vegetation zones (including Bam plot locations) within the site is displayed in **Figure 8**.

The approximate area (ha) of each vegetation zone and the number of BAM plot/ transects required to sample the vegetation in accordance with Section 5 of the BAM is presented in **Table 9**.

Table 9 BAM Plots Completed per Vegetation Zone

Zone	Veg Zone Name	PCT	Area (ha)	Min. Plots Required (BAM)	Plots Completed
1	849_Mod-Good	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain	0.15	1	1
2	849_Low	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain	1.88	1	1

Vegetation Zone 1 consists of an open forest of *Eucalyptus moluccana* (Grey Box) and *Corymbia maculata* (Spotted Gum), growing to around 18-25 m (see **Photo 1**), with the mid-canopy and shrub layer generally sparse with the exception of a juvenile individuals of Spotted Gum (see **Table 7**) and woody weeds such as *Lycium ferocissimum* (African Boxthorn) and *Nerium oleander* (Oleander). At the eastern of the patch, there are various non-indigenous native trees, such as *Callistemon viminalis* (Willow Bottlebrush), *Corymbia citriodora* (Lemon-scented Gum), *Brachychiton acerifolius* (Flame Tree), *Araucaria bidwillii* (Bunya Pine), *Casuarina cunninghamiana* (River Oak) and *Angophora costata* (Smooth-barked Apple), which were apparently planted around the former residence. The ground layer in the western end of the patch is substantially disturbed, evidently by recent construction activities on the adjoining property to the west (**Photo 2**).

Photo 1 Vegetation Zone 1 looking east, showing Grey Box and Spotted Gum (mid-ground), disturbed ground layer in foreground and exotic trees in background

Photo 2 Disturbed ground at western end of Zone 1

Vegetation Zone 2 consists of an open grassland/herbland comprising a mix of native and exotic grasses, herbs and forbs (see **Photo 3**). The canopy layer is largely absent, with the exception of one or two widely scattered relict trees (evidently former plantings) including a single isolated individual of *Eucalyptus cinereus* (Argyle Apple). The mid-canopy and shrub layer is also largely absent, but represented by a few self-sown individuals of *Acacia decurrens* (Sydney Green Wattle) (see **Table 8**). There is evidence that the area was recently ploughed with deep furrows in the soil (~1 m spacing's), which are visible in the aerial imagery for the site, with ground layer vegetation having recently colonised the disturbed ground. There are also large patches of cleared and disturbed land at the northern and northwestern ends of the site (see **Photo 4**), evidently created during recent construction on adjoining land. Reworked earth or spoil has been piled in windrows along the eastern boundary of the zone.

Photo 3 Zone 2 facing west, showing exotic ground cover and plough lines (note disturbed ground at right)

Photo 4 Zone 2 – view east across disturbed ground

Patch Size

In accordance with the BAM, patch size[2] area was calculated for each vegetation zone and assigned to a vegetation zone as a class, being < 5ha, 5–24 ha, 25–100 ha or ≥ 100 ha as per Section 5.3.2 of the BAM. Patch size for each vegetation zone is presented in **Table 10**.

Table 10 Vegetation Patch Size

Zone	Veg Zone Name	Patch No.	Area (ha)	Patch Size Class (ha)
1	849_Mod-Good	Patch 1	0 (0.15 rounds to 0)	<5 ha
2	849_Low	Patch 2	0 (low condition)	<5 ha

Vegetation Integrity Scores

The vegetation integrity scores for each vegetation zone, as appear in the BAM Calculator, are presented in **Table 11**.

Table 11 Vegetation Integrity Calculations

Zone	Veg Zone Name	Area (A)	Composition Condition Score	Structure Condition Score	Function Condition Score	Vegetation Integrity Score
1	849_Mod-Good	0.15	31	36	36.1	34.6
2	849_Low	1.88	9	16.3	17.2	13.6

[2] Patch size: an area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).

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Vegetation Zones and Plot Locations within the Project Site

FIGURE 8

3.2.4 Threatened Ecological Communities

Twenty three threatened ecological communities have been detected within a 10 kilometre radius of the Project Site (see **Appendix A**). One of these threatened ecological communities (TECs) was identified within the Project Site: the 0.15 hectares of PCT 849 Grey Box - Forest Red Gum grassy woodland (Mod-good condition) is commensurate with the TEC *Cumberland Plain Woodland in the Sydney Basin Bioregion* ('Cumberland Plain Woodland'), which is listed as critically endangered under Schedule 2 the BC Act. The following sources were consulting to make this decision:

- The BioNet Vegetation Classification profile for PCT 849, which lists Cumberland Plain Woodland CECC (see **Appendix D**);
- The Final Determination for the listing of Cumberland Plain Woodland as a critically endangered ecological community under TSC Act (NSW Scientific Committee 1997); and
- Cumberland Plain Woodland in the Sydney Basin Bioregion – profile (OEH 2018c).

The main indicators that suggest that the vegetation on the site is commensurate with the definition of Cumberland Plain Woodland are:

- The location of the site within the Cumberland IBRA subregion;
- The presence of a patch of grassy woodland vegetation (indicative of the Coastal Valley Grassy Woodlands vegetation class);
- The open woodland structure of the vegetation;
- The presence of diagnostic canopy species (i.e. Grey Box and Spotted Gum);
- The presence of diagnostic shrub species *Bursaria spinosa* (Blackthorn);
- The presence of diagnostic groundcover species, including native grasses, herbs and forbs, such as *Rytidosperma* sp. (Wallaby Grass), *Microlaena stipoides* (Weeping Grass) and *Dichondra repens* (Kidney Weed); and
- Soils containing a high clay content, which suggests a shale influence and the presence of Wianamatta Shale in the underlying geology.

Although the vegetation lacks many of the floristic characteristics of better quality sites, the Final Determination (NSW Scientific Committee 1997) for the community states that "*the structure of the community varies depending on past and current disturbances, particularly clearing, fire and grazing. Contemporary tree-dominated stands of the community are largely relics or regrowth of originally taller forests and woodlands, which are likely to have had scattered shrubs and a largely continuous grassy groundcover*."

Based on the vegetation condition definitions presented in **Section 2.3.2**, the Cumberland Plain Woodland vegetation within the Project Site is moderate to good condition. Further information pertaining to the classification of the community and its conservation status is presented in **Table 12**.

Table 12 PCT 849 – Structural Information and Conservation Status

Vegetation Formation	Class	Plant Community Type	% cleared	Associated TEC	Listing Status (BC Act)
Grassy Woodlands	Coastal Valley Grassy Woodlands	849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	93	Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community

The extent of *Cumberland Plain Woodland in the Sydney Basin Bioregion* within the Project Site is presented in **Figure 9.** This vegetation is also a Serious and Irreversible Impact Entity (SAII Entity) as discussed in **Section 4.5**.

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Threatened Ecological Communities within the Project Site

FIGURE 9

3.3 Fauna Species and Habitat

A total of 16 fauna species were identified during the assessment, comprising 14 species of birds (three exotic), one mammal (exotic) and one reptile, all of which are common and widespread species that are often recorded in urban areas of the Sydney Basin region. A complete list of fauna species identified during the assessment is presented in **Appendix E.**

On the adjoining land to the north and east, Travers Bush Fire and Ecology (2016) identified a total of 30 fauna species, comprising 16 birds, seven mammals, two reptiles and five amphibians. The Travers survey work was completed as part of the Biodiversity Assessment Report for the original Logos industrial development application (SSD 7155).

Many of the habitat features that are important for occupancy of native fauna species are absent from the site, probably as a result of historic and recent agricultural management. These include the following:

- Aquatic habitat, including watercourses and dams, which is required for both aquatic and amphibious species;
- Hollow-bearing trees, which are important for nesting birds and arboreal mammals;
- High native flora diversity, which is important for insects, foraging birds and mammals;
- Complex vegetation structure, which generally encourages occupancy of a diversity of fauna groups;
- Soft substrates, which are important for burrowing species such as reptiles and terrestrial mammals; and
- Ground habitat features such as dense leaf litter, habitat logs or exfoliating rock. These features are generally important for terrestrial fauna diversity.

The available habitat for fauna species within the Project Site is therefore generally restricted to the small stand of tree canopy (limited to a select number of mature native trees) and native groundcover (where present) that occur within the patch of Grey Box - Forest Red Gum grassy woodland in the southern portion of the site. Fauna species with the greatest potential to utilise the site are highly mobile species, namely bat and bird species, which may temporarily perch or forage above or within the tree canopy of the woodland patch and elsewhere over the cleared parts of the site. Locally occurring bird species, such as those recorded on the site (**Appendix E**), might forage on blossom and nectar produced by the trees (during seasonal flowering periods) on site, although given the small size of the patch, and its landscape context, the site would have negligible value as a foraging resource for locally occurring species.

Microchiropteran bat ('micro-bat') species could also potentially forage on site, although the site lacks suitable roosting and breeding sites for micro-bats, including tree hollows, fissures in bark, caves and overhangs, or cavities within existing buildings, culverts and pipes.

3.4 Threatened Species (BC Act)

This section describes the threatened species predicted to occur within the Project Site, based on the field survey results, the outputs of desktop assessment and the outputs of the BAM Credit Calculator, in accordance with Section 6 of the BAM. The following sections describe 'ecosystem credit species' and 'species credit species' separately, in accordance with Section 6 of the BAM.

3.4.1 Desktop Results (BioNet)

A search of the OEH Bionet Atlas (dated 15/11/2018) detected a total of returned a total of 2,196 records of 46 species, comprising 17 threatened plant species, 29 threatened fauna species and one threatened population within a five kilometre radius of the centre of the Project Site (see **Appendix A**). A map showing the locations of previous Wildlife Atlas threatened species records is provided in **Figure 10**.

Based on the habitats recorded at the site, none of these species or populations is assessed as having a high or moderate likelihood of occurrence on the site. A detailed assessment of the likelihood of occurrence of all threatened species and endangered populations previously recorded in the locality and predicted to occur in the BAM Calculator is provided in **Appendix A.**

3.4.2 Threatened Species Survey Results

No threatened species were within the Project Site during the current survey or during previous surveys. Review of habitat descriptions of the predicted species provided in the Threatened Species Data Collection (OEH 2018a) reveal that the habitats present on the site are degraded to the extent that the site is unlikely to provide suitable habitat for any threatened plant species.

In regards to threatened fauna species, individuals of mobile species, notably microchiropteran bats and some forest and woodland bird species, could occur on the site on a transient or seasonal basis, but only temporarily as part of their foraging, migration or dispersal activities. The site does contain sufficiently large, good condition or intact habitats to support viable local populations of any threatened species considering the small size of the patch, the highly modified nature of the habitats and the surrounding land use.

3.4.3 Ecosystem Credit Species (BAM Credit Calculator)

A total of 27 threatened species have been predicted to occur within the Project Site by the BAM Credit Calculator[3]:

- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- Diamond Firetail (*Stagonopleura guttata*);
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Flame Robin (*Petroica phoenicea*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*);
- Koala (*Phascolarctos cinereus*);
- Little Bentwing-bat (*Miniopterus australis*);
- Little Eagle (*Hieraaetus morphnoides*);

[3] Case 00013133/BAAS17104/18/00013134 / Revision: November 2018.

- Little Lorikeet (*Glossopsitta pusilla*);
- Masked Owl (*Tyto novaehollandiae*);
- Painted Honeyeater (*Grantiella picta*);
- Powerful Owl (*Ninox strenua*);
- Regent Honeyeater (*Anthochaera phrygia*);
- Scarlet Robin (*Petroica boodang*);
- Speckled Warbler (*Chthonicola sagittata*);
- Spotted Harrier (*Circus assimilis*);
- Spotted-tailed Quoll (*Dasyurus maculatus*);
- Square-tailed Kite (*Lophoictinia isura*);
- Swift Parrot (*Lathamus discolor*);
- Turquoise Parrot (*Neophema pulchella*);
- Varied Sittella (*Daphoenositta chrysoptera*);
- White-bellied Sea Eagle (*Haliaeetus leucogaster*); and
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

The predicted occurrence of these threatened species is based on the PCT that has been mapped within the Project Site, the distributional range of the species, the condition of the vegetation, and patch size (as per Section 6 of the BAM). No ecosystem credit species were excluded from the BAM Credit Calculator to determine the offset obligation for the removal of PCT 849 from the site.

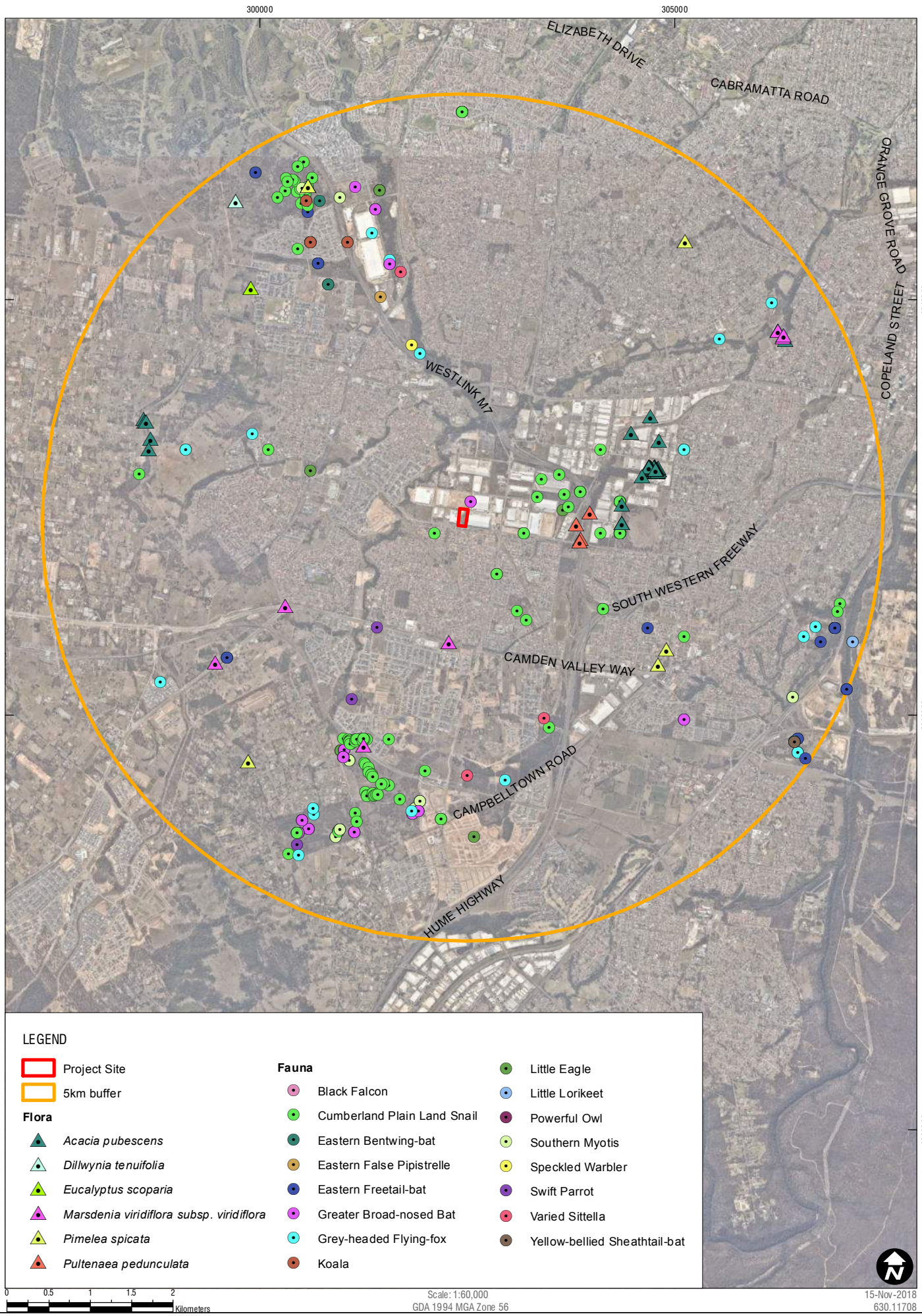
The *Predicted Threatened Species Report* from the BAM Credit Calculator is provided in **Appendix F.**

3.4.4 Candidate Species Credit Species

A total of 33 'candidate' threatened species (i.e. species that generate species credits) are determined to be relevant to the Project Site according to the BAM Credit Calculator (see *BAM Candidate Species Report* in **Appendix F**). Of these, seven threatened species have been identified by the Assessor as 'Confirmed candidate species' in the BAM Calculator (in accordance with the steps under Section 6.4 of the BAM) and these species require survey. The seven species requiring survey are listed as follows:

- *Acacia pubescens* (Downy Wattle);
- *Caladenia tessellata* (Thick-lipped Spider-orchid);
- *Meridolum corneovirens* (Cumberland Plain Land Snail);
- *Dillwynia tenuifolia*;
- Grevillea juniperina subsp. juniperina (Juniper-leaved Grevillea)
- *Pimelea spicata* (Spiked Rice-flower);
- *Pultenaea pedunculata* (Matted Bush-pea).

Details regarding the above listed threatened species are provided in **Table 13**.



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Previous Records of Threatened Species within the Locality (NSW Wildlife Atlas)

FIGURE 10

Table 13 Threatened species requiring survey

Species Name	BC Act	Key Information
Downy Wattle *Acacia pubescens*	V	The distribution of this species is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. This species occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.
Thick-lipped Spider-orchid *Caladenia tessellata*	V	Occurs from Central Coast NSW to southern VIC. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils.
Cumberland Plain Land Snail *Meridolum corneovirens*	E1	The species lives in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. The species inhabits Cumberland Plain Woodland living under a litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish in
Dillwynia tenuifolia	V	Low spreading pea-flower shrub to one metre high. The core distribution is the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee. The species occurs in dry sclerophyll woodland with tertiary alluvium soils.
Juniper-leaved Grevillea *Grevillea juniperina subsp. juniperina*	V	Easily identified medium-sized shrub with green prickly leaves. Endemic to Western Sydney. Occurs on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium.
Spiked Rice-flower *Pimelea spicata*	E1	Small erect or spreading shrub best detected when producing distinctive white/pink tubular flowers from October to May. The species occurs on well-structured clay soils particularly in association with Grey Box vegetation types.
Matted Bush-pea *Pultenaea pedunculata*	E1	Inhabits woodland vegetation, but plants have also been found on road batters and coastal cliffs. .

Threatened species surveys were conducted for the above species during the initial survey in July 2018 and during the current BAM survey in November 2018. The combined survey effort of both surveys has ensured that surveys have been conducted for all candidate species requiring survey within the recommended survey period (i.e. the specified months) in the BAM Calculator, including during the flowering period of orchids and other cryptic threatened plants. No evidence for any threatened species was recorded during either survey. Accordingly, due to a lack of evidence and taking into consideration the nature, condition and extent of the habitat present, all seven species are listed as "No (surveyed)" for 'species presence' in the BAM Calculator, meaning they are not present on the site, based on evidence collected from field surveys.

The remaining 26 candidate species are listed as 'not on site' in the *Candidate Species Report.*

Given that the Project Site consists of a modified environment, consisting of a small patch of woodland and mostly exotic grassland within a high density industrial area, the habitat is considered unsuitable for all Candidate Species Credit Species resulting in no Species Credit Species requiring survey.

Threatened fauna species with the greatest potential to utilise the site are highly mobile species including bat and bird species. Threatened micro-bat species could also potentially forage on site and potentially utilise cavities within existing buildings, culverts and pipes in the locality. However, these habitats are not considered to be important to the long-term survival of these species within the locality. The absence of aquatic habitats excludes the presence of wetland birds and habitat for threatened amphibian species.

3.5 Threatened Populations (BC Act)

One endangered population, *Marsdenia viridiflora* subsp. *viridiflora*, is known within a 10 kilometre radius of the Project Site. This species typically grows in vine thickets and open shale woodland (OEH 2018c). This habitat is not present within the Project Site.

A description of threatened populations and their habitats as well as an assessment of their likelihood of occurrence on the Project Site is included in **Appendix A**.

3.6 Prescribed Biodiversity Values

With reference to Section 6.7 of the BAM, the Project Site does not contain any of the 'prescribed biodiversity values' identified in that section, as follows:

- Karst, caves, crevices and cliffs;
- Occurrences of rock;
- Human made structures (deemed to be habitat for a threatened species or ecological community). It is noted that the disused remains of a former residential dwelling are present on the site but have recently been destroyed by fire. The dwelling structure that remains *in situ* is damaged to the extent that it does not contain any suitable roost sites for micro-bats;
- Watercourses or hydrological processes that interact with rivers and streams; and
- The proposed development is not for a wind farm.

Further discussion of potential impacts on prescribed biodiversity values is provided in **Section 4.4.**

3.7 EPBC Act Protected Matters

A search of the Protected Matters Search Tool (dated 15/11/18) reveals that 71 matters of national environmental significance listed under the EPBC Act are predicted to occur within the locality of the site (see **Appendix G**). Relevant matters of national environmental significance which are predicted to occur in the locality comprise:

- Threatened species;
- Migratory species; and
- Listed ecological communities.

A brief discussion of the above three matters is provided below.

Conversely, no other matters of national environmental significance exist or are predicted to occur in the locality, including World heritage properties, National heritage places, Ramsar Wetlands, or Commonwealth marine areas. The Great Barrier Reef Marine Park, nuclear actions (including uranium mining) and water resources, in relation to coal seam gas development and large coal mining developments, are not relevant to the project.

3.7.1 Listed Threatened Species

A total of 47 threatened species listed under the EPBC Act are predicted to occur in the locality of the site. No EPBC Act listed species were recorded on the site during the current or previous investigations. Notably, no EPBC Act threatened species were recorded on the surrounding properties by Travers (2016).

Due to the lack of suitable habitats or resources, the small size of available woodland habitat and the poor condition of available habitats, no EPBC Act listed threatened species are likely to occur on the Project Site. Moreover, the Project Site would not constitute 'important habitat', as defined in the EPBC Act *Significant Impact Guidelines 1.1* (DEWHA 2013) for any EPBC Act listed species. This is mainly due to a lack of native vegetation and habitat features including those described in **Section 3.3.** Further details on habitat requirements and likelihood of occurrence on the site of relevant EPBC Act listed threatened species is provided in **Appendix A**.

3.7.2 Listed Migratory Species

A total of 16 migratory species (and/or their habitats) listed under the EPBC Act are predicted to occur within the locality of the Site. The migratory species predicted to occur comprise, marine species, terrestrial species and wetland species, as follows:

- Migratory Marine Birds - one species, the Fork-tailed Swift, is a seasonal migrant, is always on the wing and could occur in flight above the site.
- Migratory Terrestrial Species – seven species. Species such as the Satin Flycatcher and Rufous Fantail are nomadic throughout their ranges and utilise woodland (and other) habitats during their dispersal and foraging movements. It is theoretically possible, therefore, that individuals of one or more of these species could occur on the site, but only on a transient or temporary basis. The Site would not represent important habitat for any such species, given their large ranges and the relatively small and marginal patch of potential habitat on the site.
- Migratory Wetland Species – eight species of wetland birds, none of which are relevant to the site as the site contains no wetland habitat.

In accordance with the above points, the Project Site at Prestons is not considered to represent important habitat for any listed migratory species and would represent only marginal resting or foraging habit for a narrow selection of terrestrial migratory species.

3.7.3 Threatened Ecological Communities

A total of eight threatened ecological communities listed under the EPBC Act are predicted to occur in the locality. Of these, one community is of potential relevance to the site: *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* ('Cumberland Plain Shale Woodlands'), which is listed as critically endangered under the Act. In this regard, the 0.15 ha patch of PCT 849 moderate to good condition Grey Box - Forest Red Gum grassy woodland in the southern portion of the site (see location in

Figure 7) was assessed for its potential to qualify as the EPBC Act listed community Cumberland Plain Shale Woodlands.

Review of the DEWHA (2010) identification guidelines for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest, reveals that the patch of woodland on the site (see **Section 3.2)** does not meet the criteria for Cumberland Plain Shale Woodland due to the fact that the patch size of the community is less than 0.5 hectares in size. Consequently, the patch of PCT 849 Mod-good (Zone 1) on the Project Site is not Cumberland Plain Shale Woodland, as defined under the EPBC Act. Moreover, this patch of vegetation does not meet the definition of any other EPBC Act listed communities. The remaining parts of the site, which are cleared and disturbed and contain largely exotic vegetation (mapped as PCT 849 Low condition (Zone 2)), do not contain the characteristic canopy or understorey species of Cumberland Plain Shale Woodland and clearly do not meet the definition of the EPBC Act listed community.

Accordingly, the Project Site does not contain any EPBC Act listed threatened communities.

4 Stage 2 - Impact Assessment

This chapter details the potential impacts of the proposed development on biodiversity values, in accordance with Stage 2 of the BAM.

4.1 Avoidance of Impacts on Biodiversity Values

Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the project to date, in accordance with Section 8 of the BAM. Due to the small size of the Project Site and the operational and design requirements for the project, including minimum floor space and car parking requirements, the project requires that the entire site be utilised for proposed buildings and ancillary structures. Consequently, there is no potential to avoid impacts on biodiversity values within the Project Site.

In relation to the recommendations for avoiding and minimising impacts on native vegetation and habitat during project planning, as per Section 8.1 of the BAM:

- The location of the project – the location of the proposed MOD 6 facility is driven by the its integration into a larger project, being an extension of the existing Warehouse 5 facility to the east and other Toll facilities on adjacent sites. In this regard, the proposed location of MOD 6 is the optimal location for the proposed development in the context of the wider Toll warehousing project at Prestons. Any other location alternatives would not be suitable due to greater logistics requirements and transport times.
- Designing the project – the floor space requirements for the proposed building and operational requirements for truck movements (including internal roads and turning radii) and minimum requirements for private vehicle car parking are such that the proposed site layout occupies the entire site. Any alternative layout options considered would also utilise the entire site area. Hence, there are no opportunities to retain native vegetation within the Project Site through modifications to the proposed site layout.

In relation to the recommendations for avoiding and minimising prescribed biodiversity impacts during project planning (as per Section 8.2 of the BAM):

- There are no prescribed biodiversity values on the Project Site, as noted in **Section 3.6** and hence no impacts on prescribed biodiversity values, as per **Section 4.4.**

4.2 Direct Impacts

4.2.1 Impacts on Native Vegetation

The entirety of the Project Site will be cleared and developed as part of the MOD 6 application, with earthworks and cut and fill required across the site to achieve design levels. All vegetation within the Project Site will be removed. Impacts have been calculated in the BAM Calculator on this basis. A summary of the impacts of vegetation removal within each vegetation zone is presented in **Table 14**.

Table 14 Vegetation Impact Summary

Vegetation Zone#	BC Act	TEC	Area removed (ha)	Area retained (ha)
PCT 849_Mod-good	Critically endangered	Cumberland Plain Woodland	0.15	0.00
PCT 849_Low (Disturbed Land and Non-native Vegetation)	-	-	1.88	0.00
Total			**2.03**	**0.0**

See **Figure 8** for locations of vegetation zones.

The impacts on native vegetation summarised in terms of vegetation integrity loss are provided in the *BAM Credit Summary Report* in **Appendix F** and summarised in **Table 15**.

Table 15 Vegetation Integrity Calculations

Zone	Veg Zone Name	Area (A)	Vegetation Integrity Loss	Sensitivity to gain	Risk Weighting	SAII# Candidate
1	849_Mod-Good	0.15	34.6	High	2.5	Yes
2	849_Low	1.88	13.6	High	2.5	Yes

Serious and irreversible impact entity

4.2.2 Impacts on Fauna Habitat

Impacts on fauna habitat within the Project Site be in general limited in extent and involve loss of a relatively small and isolated patch of Grey Box Forest Red Gum woodland as well as a larger area of disturbed land containing a mix of exotic and native vegetation. Impacts on fauna habitat will comprise:

- removal of a small number of mature and juvenile native woodland trees, being mainly Grey Box and Spotted Gum that exist within the small woodland patch;
- removal of a selection of non-indigenous and exotic trees (apparently planted around the curtilage of the former residence); and
- removal of grassy ground cover layer in the woodland patch and across the remainder of the site.

The loss of a small number of mature native trees, including myrtaceous species, will result is the loss of perching and resting sites, as well as foraging resources (such as blossom and nectar in flowering trees) for locally occurring woodland bird species and micro-bats.

The open disturbed parts of the site could represent foraging and hunting space for local raptors, such as the Nankeen Kestrel and Australian Hobby, which might prey on small rodents (e.g. Black Rat or house mouse), insects and small birds on the site. However, the site would represent only a small fraction of the foraging territory available to local species and its removal would have no measurable impact on their foraging behaviour or life cycles.

No hollow-bearing trees, nests, burrows, water resources or other important habitat features for native fauna will be removed. Hence removal of the woodland vegetation from the site will not impose adverse effects on hollow dependent native arboreal fauna, particularly birds and micro-bats.

None of the habitat features within the Project Site are considered to be important to the long-term survival of fauna species within the locality. The removal of marginal foraging habitat is therefore considered to be negligible.

4.2.3 Impacts on Threatened Species Habitat

Threatened fauna species with the greatest potential to utilise the site are highly mobile species including bat and bird species. Threatened micro-bat species could also potentially forage on site and potentially utilise cavities within existing buildings, culverts and pipes in the locality. None of the habitat features within the Project Site are considered to be important to the long-term survival of threatened fauna species within the locality. The removal of marginal foraging habitat for these species is therefore considered to be negligible.

4.2.4 Impact on Threatened Ecological Communities

Construction of the proposed development will require the removal of approximately 0.15 hectares of Cumberland Plain Woodland CEEC. This impact has been addressed in the BAM Calculator as part of the removal of the Grey Box Forest Red Gum grassy woodland vegetation in Zone 1 (PCT 849_Mod-good). (Note that the vegetation in Zone 2 PCT 849_Low does not qualify as the CEEC).

Additionally, Cumberland Plain Woodland CEEC is a serious and irreversible impact (SAII) entity and as such impacts have been addressed in **Section 4.5** accordance with the criteria under 10.2.2.1 of the BAM.

4.3 Indirect Impacts

No vegetation or habitat is to be retained within the Project Site and no vegetation or habitat currently exists adjacent to the site. Construction and operation of the Project therefore, will have no indirect effects on any native vegetation or fauna habitats within or adjacent to the site.

Potential indirect impacts to native vegetation and habitat may occur during the construction and operational phase of the project. Such impacts may include the following:

- Increased traffic and visitation within the Project Site may facilitate the spread of weeds that could further degrade offsite native vegetation;
- Pollution such as chemical spills from construction machinery may have adverse effects on native vegetation, fauna and downstream waterways (i.e. Prospect Creek occurs approximately one kilometre to the west, although there are no natural watercourses within the site);
- Ground disturbance by machinery during the construction phase may create dust and facilitate the movement of water-borne sediment. Sedimentation could adversely affect the downstream riparian vegetation and habitats;
- Increased noise by vehicles, machinery and increased human visitation may disrupt the natural behaviour of fauna species (if and where present) during the construction phase; and
- Light spill from artificial lighting during the construction phase or operational phase may adversely affect the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and foraging microbats.

Mitigation measures are presented in **Section 4.7** to reduce the potential for these impacts.

4.4 Prescribed Biodiversity Impacts

Prescribed biodiversity values are addressed in **Section 3.6** of this BDAR. In relation to potential impacts on habitat of threatened species or ecological communities associated with prescribed biodiversity values, as defined under Clause 6.1 of the BC Regulation:

- The site does not contain the following fauna habitat features:
  - karst, caves, crevices, cliffs and other geological features of significance;
  - "rocks" *per se*, being natural rock formations and rock outcrops;
  - human-made structures, although at the time of the survey for the current assessment (November 2018), the remnants of a disused residence remain on the site. However, due to the dilapidation of the structure (it has evidently been destroyed by fire), it does not provide suitable roost sites for microchiropteran bats; and
  - non-native vegetation is present on the site; however, the planted trees and exotic groundcovers recorded on the site are not likely to be of any importance to the survival of any threatened biota in the locality;
- the woodland vegetation on the site is isolated in the landscape, is not contiguous with any other vegetation on adjoining or nearby lands and hence not relevant to the connectivity of habitat for threatened species that could facilitate the "movement of those species across their range";
- the development site is not relevant to the movement of threatened species through the landscape (as noted above) such that it would make any meaningfully contribution to the maintenance of their lifecycles;
- the development site contains no watercourses and therefore is of no relevance to "water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities";
- the proposed development does not involve wind turbines (and hence potential strikes on protected animals); and
- it is not conceivable that any threatened ground-dwelling fauna would exist on the site; hence, the risk of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community is negligible.

4.5 Serious and Irreversible Impacts

According to the *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017a), the Cumberland Plain Woodland CEEC within the Project Site is identified as a serious and irreversible impact (SAII) Entity in Appendix 2 of the guide. This is based on the principles 1 and 2 as set out in clause 6.7 of the *Biodiversity Conservation Regulation 2016*, which are as follows:

- Principle 1 – species or ecological community currently in a rapid state of decline; and
- Principle 2 – species or ecological communities with very small population size.

The assessment criteria for threatened communities set out in subsection 10.2.2.1 of the BAM to assess the potential for serious and irreversible impacts on Cumberland Plain Woodland are addressed in **Table 16**.

Table 16 Serious and Irreversible Impacts Assessment for Cumberland Plain Woodland

Serious and Irreversible Impacts Assessment for Cumberland Plain Woodland CEEC	
a)	*The action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII*
	The design and operational logistics requirements of the MOD 6 development are such that entire site will be utilised for the development. Hence, there are no opportunities to retain Cumberland Plain Woodland within the Project Site (See **Section 4.1**).
b)	*The area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone*
	Approximately 0.15 ha of Cumberland Plain Woodland CEEC with a vegetation integrity score of 34.6 (Veg Zone 1) will be removed by the proposal (See **Section 4.2.4**). No other patches of the CEEC will be indirectly affected.
c)	*A description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact*
	No thresholds have been defined for Cumberland Plain Woodland in the in the current draft of *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017a).
d)	*The extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint*
	Approximately 43 ha of the community occurs within 1,000 ha of the proposed development and 355 ha occurs with 10,000 ha. The overall condition of this vegetation has not been assessed as part of this assessment.
e)	*An estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration*
	The Bionet Vegetation Information System (OEH 2018b) estimates that the pre-European extent of the community within the Sydney Basin Bioregion was 44,000 ha. The current extent is estimated at 6,800 ha. The proposed development would result in the removal of 0.15 ha of this vegetation type.
f)	*An estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion*
	The recovery plan for Cumberland Plain Woodland (DECCW 2010) estimates that approximately 8% of the community is protected within reserves within the Sydney Basin Bioregion.
g)	*The development, clearing or biodiversity certification proposal's impact on:*
i.	*abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns*
	Due to the minor scale of vegetation clearing proposed (i.e. 0.15 ha), impacts to abiotic factors are likely to be negligible.
ii.	*Characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants*
	Due to the minor scale of vegetation clearing proposed (i.e. 0.15 ha), impacts to characteristic and functionally important species such as *Eucalyptus tereticornis* (Forest Redgum) and *Eucalyptus moluccana* (Grey Box) are likely to be negligible.
iii.	*The quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC*

Serious and Irreversible Impacts Assessment for Cumberland Plain Woodland CEEC	
	The proposed development will remove the occurrence of the CEEC from the Project Site. No CEEC vegetation will be retained within the site and there are no adjoining, adjacent or nearby stands of Cumberland Plain Woodland that could be affected by indirect impacts related to construction or operation of the project. Hence, "*threats and indirect impacts*" are not relevant to the CEEC on the Project Site. Indirect impacts are discussed in **Section 4.3.** Mitigation measures to reduce these impacts are presented in **Section 4.7.**
h)	*Direct or indirect fragmentation and isolation of an important area of the potential TEC*
	Given that the Cumberland Plain Woodland within the Project Site is already isolated in the landscape, the removal of 0.15 ha of the community is unlikely to cause significant further habitat fragmentation.
i)	*The measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.*
	Screen plantings should be planted with native trees that are characteristic of Cumberland Plain Woodland (see **Section 4.7).**
Conclusion	
Given the highly modified nature of the Cumberland Plain Woodland vegetation within the Project and the small area proposed to be cleared (i.e. 0.15 hectares), it is unlikely that the direct removal of this vegetation would constitute a serious and irreversible impact as defined by the BC Regulation.	

4.6 Impacts on EPBC Act Protected Matters

No matters of national environmental significance listed under the EPBC Act are likely to occur or are of relevance to the site (see **Section 3.7**). Consequently, the proposed development is not likely to have a 'significant impact' on any matters of national environmental significance listed under the EPBC Act. Referral of the proposed development to the Commonwealth Department of the Environment and Energy for consideration pursuant to the EPBC Act is therefore not warranted.

4.7 Mitigation and Management of Impacts on Biodiversity Values

This chapter recommends a selection of measures that are designed to reduce the risk or severity of potential indirect impacts on biodiversity values, in accordance with Section 9.3 of the BAM.

4.7.1 Construction Impacts

Construction and operational activities associated with the proposed development will directly affect vegetation and habitat on the site and have the potential to indirectly affect habitats outside of the Project Site. The following mitigation measures are recommended to minimise such impacts during and after the construction phase.

4.7.1.1 Screen Planting

The proposed development will create a medium level of visual impact for residential properties to the south of site. To mitigate the visual impact of the proposed building, screen planting is proposed on the southern boundary of the site. The planting, once fully grown in 10-15 years, will provide appropriate levels of visual screening. Further details of screen planting are provided in the Environmental Assessment Report (Urbis 2018).

4.7.1.2 Erosion Control

Mitigation measures to reduce soil erosion and pollutant run-off during construction would be included in a standard erosion and sedimentation control plan, which would include the following:

- Installation of erosion and sediment control measures prior to any works;
- Regular inspection of erosion and sediment control measures, particularly following rainfall events, to ensure their ongoing functionality;
- Management of excavated materials to prevent sediment transfer;
- Stockpiling of materials in flat cleared areas, away from site boundaries, remaining vegetation and adjacent to native vegetation, but instead use areas that are already cleared/ disturbed; and
- Undertake maintenance of silt fences and other mitigation measures to isolate runoff.

4.7.1.3 Dust Control

Specific measures to minimise the generation of dust and associated impacts on adjacent natural environments should include:

- Setting maximum speed limits for all traffic within the Project Site to limit dust generation;
- Use of a water tanker or similar to spray unpaved access tracks during the construction phase where required; and
- Application of dust suppressants or covers on soil stockpiles.

4.7.1.4 Chemical spills

Specific measures to minimise the potential for chemical spills and associated impacts on adjacent natural environments should include the following:

- All chemicals must be kept in clearly marked bunded areas;
- Regularly inspect vehicles and mechanical plant for leakage of fuel or oil; and
- No re-fuelling of vehicles, washing of vehicles or maintenance of vehicles and plant to be undertaken within 20 m of natural drainage lines.

4.7.1.5 Weed Management

High Threat Exotic species were identified within the Project Site (see **Section 3.2**). Measures to prevent the spread of weeds should include the following weed hygiene procedures:

- All vehicles, equipment, footwear and clothing should be clean and free of weed propagules prior to entering the Project Site; and
- Any weeds that are removed during the construction phase should be disposed of appropriately.

4.7.1.6 Vegetation Clearing

The following recommendations are to be implemented during vegetation clearing:

- Areas of vegetation outside the development footprint (e.g. within adjoining road reserve of Kurrajong Road) are to be clearly demarcated with high visibility tape to prevent accidental clearing during the construction phase;
- Vegetation should be cleared in a way that will allow fauna species living in the clearing site (if any) sufficient time to move out of the area without additional human intervention;
- No clearing should occur during the early evening or at night, when nocturnal fauna species are most likely to be active; and
- The direction of clearing should also ensure that fauna species are directed away from threats such as roads, developed areas or disturbed areas.

4.7.1.7 Fauna Impacts

The following recommendations apply to the management of fauna species during construction:

- Should any injured fauna species be found during the construction period, construction must stop immediately so that the injured animal can be taken to a vet or wildlife carer. All handling of fauna species should be conducted by a qualified ecologist or wildlife carer;
- During vegetation clearing, animals that are injured or displaced are to be captured and relocated (by a qualified ecologist or wildlife carer) to nearby bushland (subject to landowner approval), or trees containing wildlife shall be sectioned and dismantled before relocating the animals; and
- Nocturnal fauna species, such as gliders and possums, if captured and rescued during vegetation clearing, are to be secured in suitable enclosures and kept in a quiet, dark and cool environment until they can be released into suitable habitat after dark.

4.7.2 Operation Impacts

4.7.2.1 Screen Planting during Operation

Maintenance of screen planting on the Kurrajong Road boundary, as proposed, should be ongoing to ensure tree canopies remain healthy and thereby provide the visual screening purpose for which they were planted.

4.7.2.2 Artificial Lighting

Artificial lighting has the potential to disrupt the natural behaviour of nocturnal fauna species such as arboreal mammals, large forest owls and microbats. To reduce potential impacts to individuals of any locally occurring species, artificial lighting should be reduced where possible within the Project Site. Lights should be turned off at night (where not required for security) and any essential lighting should be fitted with directional shades to avoid light spill into adjoining areas.

4.7.2.3 Adaptive Management

Section 9.4 of the BAM states that adaptive management such as monitoring programs are required for projects where uncertain impacts such as impacts to karst, caves, crevices, cliffs, subsidence or wind turbine strikes may occur.

No uncertain impacts have been identified for the current proposal that would require implementation of an adaptive management strategy.

4.8 Offsetting of Impacts

4.8.1 Impacts Not Requiring Further Assessment

Areas within the Project Site that qualify as 'Non-native / Disturbed' have been mapped in this assessment as a low condition form of PCT 849, as they contain some native species. Accordingly, they require further assessment, although do not require offsets, as per **Section 4.8.3**.

As noted in Section 10.4.1 of the BAM, the assessor is not required to assess areas of land on the Project Site "without native vegetation", but must still assess these areas for the potential presence of threatened species. No species credit species have been recorded within the site and predicted threatened species (i.e. ecosystem credits) have been assessed as part of the impacts on Veg Zone 2 PCT 849_Low, as discussed in **Section 4.8.3**.

4.8.2 Impacts Requiring an Offset

The BAM (OEH 2017c) establishes a framework to offset impacts on biodiversity from development through the Biodiversity Offsets Scheme.

Impacts on native vegetation (ecosystem credits)

Section 10.3.1 of the BAM sets out the thresholds for impacts on native vegetation that require offsetting based on vegetation integrity scores. The vegetation integrity score for Vegetation Zone 1 (PCT 849_Mod-good), which represents a form of the Cumberland Plain Woodland critically endangered ecological community, is > 15 and therefore the removal of 0.15 ha of this vegetation requires an offset. The vegetation integrity score for Vegetation Zone 2 (PCT 849_Low), which does not represent a threatened ecological community, is < 20 and therefore the removal of 1.88 ha of this vegetation does not require an offset.

The reduction in vegetation integrity score as a result of the impact of the proposed development and the corresponding thresholds for offsets are listed in **Table 17**.

Table 17 Vegetation Integrity Calculations

Zone	Veg Zone Name	Area (A)	Vegetation Integrity Loss	BAM VI Threshold[#]	Offset Required	Credits
1	849_Mod-Good	0.15	34.6	> 15 for endangered or critically endangered communities	Yes	3
2	849_Low	1.88	13.6	> 20 for PCTs not listed as threatened and not threatened spp. habitat	No	0
					Total	**3**

See Section 10.3 of the BAM for offsetting thresholds for impacts on native vegetation and threatened species

The extent of vegetation to be removed is presented in **Figure 11**.

Impacts on threatened species (species credits)

No species credit species (or their specific habitat constraints) were recorded on the Project Site as part of the current and previous investigations. Accordingly, no species polygons have been created for species credits and no species credits are generated in the BAM Calculator by the removal of vegetation and habitat associated with construction of the proposed development.

4.8.3 Impacts Not Requiring an Offset

The vegetation integrity score for Vegetation Zone 2 (PCT 849_Low), which does not represent a threatened ecological community or threatened species habitat, is < 20 and therefore the removal of 1.88 ha of this vegetation does not require an offset (see **Table 17**).

The extent of areas not requiring offsets is presented in **Figure 11.**

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Scale: 1:1,200
GDA 1994 MGA Zone 56

27-Nov-2018
630.11708

Note: Building layout extent is approximate.

Sheet Size : A4

SLR

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Impacts on Native Vegetation Zones

FIGURE 11

4.8.4 Offset Calculations

The BAM Calculator[4] was used to determine the offset obligation for the removal of 0.15 ha of moderate to good condition PCT 849 *Grey Box-Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*, as well as 1.88 ha of low condition variant of this PCT within the Project Site (**Table 18**). The calculation determined that the purchase and retirement of three ecosystem credits would be required to meet the offset obligation.

Table 18 Ecosystem credits for plant community types

Veg Zone	Veg Zone Name	PCT	Vegetation Integrity Loss	Ecosystem Credits
Zone 1	PCT 849_Mod-good	Grey Box-Forest Red Gum grassy woodland	34.6	3
Zone 2	PCT 849_Low	Grey Box-Forest Red Gum grassy woodland	13.6	0
			Total	**3**

No species credits are required to meet the project offset obligation.

Purchase and retirement of ecosystem credits for the development must be conducted in accordance with the *Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules* (OEH 2017b), published under clause 6.5 of the BC Regulation.

4.8.5 Fund Payment Calculation

Offset obligations can also be met by direct payment into the Biodiversity Conservation Fund. Calculations to determine the final credit price for this offset obligation, which are taken directly from the BAM Calculator, are presented in **Table 19**. The *Biodiversity payment summary report* for this BAM assessment is provided in **Appendix F.**

Table 19 Offset Requirement - Ecosystem Credits and Credit Pricing

PCT	Price Per Credit	No. Ecosystem Credits	Total Price
849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	$25,545.81	3	$76,637.44
		GST 10 %	$7,663.74
		Total	**$84,301.18**

[4] App last updated: 19/07/2018 (Version: 1.2.5.00); BAM data last updated *: 7/11/2018 (Version: 4)

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6 Definitions

The following terms are defined for the purposes of the Biodiversity Assessment Method:

Accredited person: has the same meaning as in the BC Act, referred to in the Biodiversity Assessment Method as 'assessor'.

Ancillary rules: has the same meaning as set out in clause 6.5 of the NSW *Biodiversity Conservation Regulation 2017*.

Annual probability of decline in vegetation and habitat condition: an estimate of the average probability of decline of each attribute through clearing, stochastic factors or ongoing degrading actions (firewood removal, weed invasion, livestock grazing).

Areas of geological significance: geological features such as karst, caves, crevices, cliffs.

Assessment area surrounding the subject land: the area of land in the 1500 m buffer zone around a Project Site, or land to be biodiversity certified or a biodiversity stewardship site, that is determined in accordance with Subsection 4.3.2 of the Biodiversity Assessment Method.

Assessor: the person accredited under the NSW *Biodiversity Conservation Act 2016* referred to in Subsection 2.1.2 of the Biodiversity Assessment Method and who has been engaged by the proponent.

Averted loss: the gain in vegetation and habitat condition that arises from managing the proposed land as an offset compared to the probable future vegetation condition if the land was to be left unmanaged (see *Annual probability of decline*).

Avoid: measures taken by a proponent such as careful site selection or actions taken through the design, planning, construction and operational phases of the development to completely avoid impacts on biodiversity values, or certain areas of biodiversity. Refer to the Biodiversity Assessment Method for operational guidance.

BAM: the Biodiversity Assessment Method.

BC Act: the NSW *Biodiversity Conservation Act 2016*.

BC Regulation: the NSW *Biodiversity Conservation Regulation 2017*.

Benchmark data: for a PCT, vegetation class or vegetation formation benchmark data is contained in the BioNet Vegetation Classification. A local reference site may also be used to establish benchmark data for a PCT that may be used in a BAM assessment.

Benchmarks: the quantitative measures that represent the 'best-attainable' condition, which acknowledges that native vegetation within the contemporary landscape has been subject to both natural and human-induced disturbance. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.

Biodiversity Assessment Method (BAM): is established under section 6.7 of the NSW *Biodiversity Conservation Act 2016* (BC Act) The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act, *Local Land Services Act 2013* or the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.*

Biodiversity certification: has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity Certification Assessment Report (BCAR): has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity credit report: the report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a Project Site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.

Biodiversity Development Assessment Report (BDAR): has the same meaning as in the BC Act. Biodiversity offsets: management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.

Biodiversity stewardship agreement: has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity stewardship site: has the same meaning as in the NSW *Biodiversity Conservation Act 2016*.

Biodiversity Stewardship Site Assessment Report (BSSAR): the report that must be prepared in accordance with the Biodiversity Assessment Method and submitted as part of an application for a biodiversity stewardship agreement.

Biodiversity values: has the same meaning as clause 1.5(2) of the NSW *Biodiversity Conservation Act 2016*.

Biodiversity values map: is established according to clause 7.3 of the NSW *Biodiversity Conservation Regulation 2017*. Development within an area identified on the map requires assessment using the BAM.

BioNet Atlas: the OEH database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the TSC Act) and some fish.

Bionet Vegetation Classification: the master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm.

Broad condition state: areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.

Certified more appropriate local data: has the same meaning as set out in Subsection 2.2.2 of the Biodiversity Assessment Method.

Change in vegetation integrity score for a biodiversity stewardship site: the difference (gain) between the estimated vegetation integrity score without management at a biodiversity stewardship site and the predicted future vegetation integrity score with management at a biodiversity stewardship site.

Class of biodiversity credit: as defined in Section 11.3 of the Biodiversity Assessment Method.

Clearing site: the site proposed to be cleared of native vegetation where approval is sought under Part 5A of the *Local Land Services Act 2013* or the *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.*

Clonal species: flora species that propagate asexually at a site or have a limited degree of sexual reproduction, either within or between sites. Modes of asexual reproduction will include vegetative reproduction such as by rhizomes, root suckers or bulb replication.

Connectivity: the measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.

Credit Calculator: the computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 of the Biodiversity Assessment Method to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.

Critically endangered ecological community (CEEC): an ecological community specified as critically endangered in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Crown cover: the vertical projection of the periphery of tree crowns within a designated area.

Derived vegetation: PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Derived communities can have one or more structural components of the vegetation entirely removed or severely reduced (e.g. over-storey of grassy woodland), or have developed new structural components where they were previously absent (e.g. shrubby mid-storey in an open woodland system).

Project Site: an area of land that is subject to a proposed development application, application for approval, or activity within the meaning of Part 5 of the EP&A Act. The term development is also taken to include clearing, except where the reference is to a small area development or a major project development.

Development footprint: the area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials. The term development footprint is also taken to include clearing footprint except where the reference is to a small area development or a major project development.

Project Site: an area of land that is subject to a proposed development that is under the EP&A Act. The term Project Site is also taken to include clearing site except where the reference is to a small area development or a major project development.

Ecosystem credits: a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a Project Site and the gain in biodiversity values at a biodiversity stewardship site.

Endangered ecological community (EEC): an ecological community specified as endangered in Schedule 2 of the BC Act, or listed under the EPBC Act.

Environment Agency Head: has the same meaning as in the BC Act.

EP&A Act: the NSW Environmental Planning and Assessment Act 1979.

EPBC Act: the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Ephemeral flora species: flora species where the abundance of the species above ground fluctuates in response to the plant life history in combination with environmental conditions and/or disturbance regimes. Fluctuations in abundance may be short-term (seasonal) or long-term (yearly to decadal). Many ephemeral species persist underground through unfavourable conditions via soil seed banks or dormant vegetative organs (bulbs, tubers, rootstocks).

Estuarine area: a semi-enclosed body of water having an open or intermittently open connection with the ocean, in which water levels do not vary with the ocean tide (when closed to the sea) or vary in a predictable, periodic way in response to the ocean tide at the entrance (when open to the sea).

Expert: a person who has the relevant experience and/or qualifications to provide expert opinion in relation to the biodiversity values to which an expert report relates.

Foliage cover: the percentage of a plot area that would be covered by a vertical projection of the foliage and branches and trunk of a plant, or plants or a growth form group. Foliage cover can also be referred to as percent foliage cover.

Gain: the gain in biodiversity values at a biodiversity stewardship site, over time from undertaking management actions at a biodiversity stewardship site. Gain in biodiversity values is the basis for creating biodiversity credits at the biodiversity stewardship site.

Grassland: native vegetation classified in the vegetation formation 'Grasslands' in Keith (2004)2. Grasslands are generally dominated by large perennial tussock grasses, lack of woody plants, the presence of broad-leaved herbs in inter-tussock spaces, and their ecological association with fertile, heavy clay soils on flat topography in regions with low to moderate rainfall.

Growth form: the form that is characteristic of a particular flora species at maturity. Growth forms are set out in Appendix 4.

Habitat: an area or areas occupied, or periodically or occasionally occupied, by a species or ecological community, including any biotic or abiotic component.

Habitat component: the component of habitat that is used by a threatened species for either breeding, foraging or shelter.

Habitat surrogates: measures of habitat that predict the occurrence of threatened species and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.

Herbfield: native vegetation which predominantly does not contain an over-storey or midstorey and where the ground cover is dominated by non-grass species.

High threat exotic plant cover: plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species. Also referred to as high threat weeds.

Hollow bearing tree: a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if:

(a) the entrance can be seen;

(b) the entrance width is at least 5 cm;

(c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance);

(d) the hollow is at least 1m above the ground. Trees must be examined from all angles.

IBRA region: a bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system 3, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.

IBRA subregion: a subregion of a bioregion identified under the IBRA system.

Impact assessment: an assessment of the impact or likely impact of a development on biodiversity values which is prepared in accordance with the BAM.

Impacts on biodiversity values: loss in biodiversity values from direct or indirect impacts of development in accordance with Chapters 8, 1 and 10.

Important wetland means: a wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) from time to time, and the actual location on the ground that corresponds to a SEPP 14 Coastal wetland.

Individual: in relation to organisms, a single, mature organism that is a threatened species, or any additional threatened species listed under Part 13 of the EPBC Act.

Intact vegetation: vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present.

Intrinsic rate of increase (ir): an estimate of the rate of gain for an attribute at a biodiversity stewardship site from actions undertaken as part of the management plan. The intrinsic rate of increase is specified for an attribute according to the formation of the PCT being assessed (see Appendix 8).

Landscape attributes: in relation to a Project Site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site.

Large tree benchmark: is the largest stem size class for a PCT as determined by the benchmark for the PCT.

Life cycle: the series of stages of reproduction, growth, development, aging and death of an organism.

Life form: the form that is characteristic of a particular species at maturity. In the BAM, life form has the same meaning as growth form for flora species.

Linear shaped development: development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.

Litter cover: the percentage ground cover of all plant material that has detached from a living plant, including leaves, seeds, twigs, branchlets and branches (<10cm in diameter).

Local population: the population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.

Local wetland: any wetland that is not identified as an important wetland (refer to definition of Important wetland).

Loss of biodiversity: the loss of biodiversity values from a Project Site, native vegetation clearing site or land where biodiversity certification is conferred.

Major project: State Significant Development and State Significant Infrastructure.

Minimise: a process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values.

Mitchell landscape: landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Multiple fragmentation impact development: developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.

Native ground cover: all native vegetation below 1m in height, including all such species native to NSW (i.e. not confined to species indigenous to the area).

Native ground cover (grasses): native ground cover composed specifically of native grasses.

Native ground cover (other): native ground cover composed specifically of non-woody native vegetation (vascular plants only) <1m in height that is not grass (e.g. herbs, ferns).

Native ground cover (shrubs): native ground cover composed specifically of native woody vegetation <1m in height.

Native mid-storey cover: all vegetation between the over-storey stratum and a height of 1m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. native species not local to the area can contribute to mid-storey structure).

Native over-storey cover: the tallest woody stratum present (including emergent) above 1m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community, the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.

Native plant species richness: the number of different native vascular plant species that are characteristic of a PCT.

Native vegetation: has the same meaning as in section 1.6 of the BC Act.

Native vegetation cover: the percentage of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation relative to the approximate benchmarks for the PCT, taking into account vegetation condition and extent. Native over-storey vegetation is used to determine the percent cover in woody vegetation types, and native ground cover is used to assess cover in non-woody vegetation types.

Number of trees with hollows: a count of the number of living and dead trees that are hollow bearing.

Offset rules: are those established by the BC Regulation.

Onsite measures: measures and strategies that are taken, or are proposed to be taken at a Project Site to avoid and minimise the direct and indirect impacts of the development on biodiversity values.

Operational Manual: the Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM.

Patch size: an area of intact native vegetation that:

a) occurs on the Project Site or biodiversity stewardship site, and

b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the Project Site or biodiversity stewardship site.

PCT classification system: the system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification.

Percent cleared value: the percentage of a PCT that has been cleared as a proportion of its pre-1750 extent, as identified in the BioNet Vegetation Classification.

Plant community type (PCT): a NSW plant community type identified using the PCT classification system.

Plot: an area within a vegetation zone in which site attributes are assessed.

Population: a group of organisms, all of the same species, occupying a particular area.

Probability of reaching benchmark: the probability of a specific attribute or growth form group reaching benchmark conditions in the vegetation zone at the end of the management timeframe.

Proponent: a person who intends to apply for consent or approval to carry out development, clearing, biodiversity certification or for approval for infrastructure.

Reference sites: the relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.

Regeneration: the proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5cm within a vegetation zone.

Residual impact: an impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.

Retirement of credits: the retirement of biodiversity credits from a biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.

Riparian buffer: an area of land determined according to Appendix 3.

Risk of extinction: the likelihood that the local population or CEEC or EEC will become extinct either in the short term or in the long term as a result of direct or indirect impacts on the viability of that population or CEEC or EEC.

SAII Entity: candidate species and communities that are sensitive to serious and irreversible impacts.

SEPP 14 Coastal wetland: a wetland to which State Environmental Planning Policy No 14 – Coastal Wetlands applies or an area that is identified as a coastal wetland within the meaning of the term coastal wetlands and littoral rainforests area for the purposes of Coastal Management Act 2016.

Site attributes: the matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.

Site-based development: a development other than a linear shaped development, or a multiple fragmentation impact development.

Site context: the value given to landscape attributes of a Project Site or biodiversity stewardship site after an assessment undertaken in accordance with Section 4.3.

Species credit species: are threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.

Species credits: the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.

State Significant Development: has the meaning given by Division 4.1 of Part 4 of the EP&A Act.

State Significant Infrastructure: has the meaning given by Part 5.1 of the EP&A Act.

Stream order: has the same meaning as in Appendix 3.

Subject land: is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a Project Site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.

Threat status class: the extent to which a species or ecological community is threatened with extinction, or the extent to which a PCT is estimated to have been cleared (see Percent cleared value).

Threatened Biodiversity Data Collection: part of the BioNet database, published by OEH and accessible from the BioNet website at www.bionet.nsw.gov.au.

Threatened ecological community (TEC): means a critically endangered ecological community, an endangered ecological community or a vulnerable ecological community listed in Schedule 2 of the BC Act.

Threatened species: critically endangered, endangered or vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.

Threatened species survey: a targeted survey for threatened species undertaken in accordance with Section 6.5.

Threatened species survey guidelines: survey methods or guidelines published by OEH from time to time at www.environment.nsw.gov.au/topics/animals-and-plants/threatenedspecies/about-threatened-species/surveys-and-assessments**.**

Total length of fallen logs: the total length of logs present in a vegetation zone that are at least 10cm in diameter and at least 0.5m long.

Transect: a line or narrow belt along which environmental data is collected.

Upland Swamp Policy: the document entitled Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence as in force on the day when the BAM is published until such time as the Environment Agency Head publishes any further document for the purpose of it being adopted by the BAM as the Upland Swamp Policy.

Vegetation Benchmarks Database: a database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification. It is available at www.environment.nsw.gov.au/research/Visclassification.htm.

Vegetation class: a level of classification of vegetation communities defined in Keith (2004)4. There are 99 vegetation classes in NSW.

Vegetation formation: a broad level of vegetation classification as defined in Keith (2004)4. There are 16 vegetation formations and sub-formations in NSW.

Vegetation integrity: the condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT.

Vegetation integrity score: the quantitative measure of vegetation condition calculated in accordance with Equation 15 or Equation 16.

Vegetation zone: a relatively homogenous area of native vegetation on a Project Site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.

Viability: the capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.

Vulnerable ecological community (VEC): an ecological community specified as vulnerable in Schedule 2 of the BC Act and/or listed under Part 13, Division 1, Subdivision A of the EPBC Act.

Wetland: an area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water (see also *Important wetland* and *Local wetland*).

Woody native vegetation: native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

APPENDIX A

Threatened Species Likelihood of Occurrence

Table A1 Key to Table A2

KEY	
Status	**The "threatened species" or "endangered ecological community" listing in the Biodiversity Conservation Act 2016**
V	Species listed as "Vulnerable"
E1	Species listed as "Endangered"
E4A	Species listed as "Critically Endangered"
E2	An "endangered population"
E	An EEC listed as "endangered"
CE	An EEC listed as "critically endangered"
	The "threatened species" or "endangered ecological community" listing in the Environment Protection and Biodiversity Conservation Act 1999
V	Species listed as "Vulnerable"
E	Species listed as "Endangered"
CE	Species listed as "Critically Endangered"
M	Species listed as "Migratory""
MR	Species listed as "Marine"
LoO	**Likelihood or Occurrence - the probability of a threatened species occurring on the site**
P	Present or recorded on the Project Site
H	High likelihood of occurrence
M	Moderate likelihood of occurrence
L	Low likelihood of occurrence
N	No potential relevance
Source	**Data Source**
BAM	Predicted species or candidate species in the BAM for this project
PMST	Sourced from Protected Matters Search Tool
BioNet	Sourced from OEH Wildlife Atlas
SLR	Sourced from SLR field data and reports
NOTES	

- The table below is based on data obtained from the recently reformed Atlas of NSW Wildlife website http://www.bionet.nsw.gov.au/, and the following notes accompany this dataset.
- Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Â°; ^^ rounded to 0.01Â°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Licensed Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -33.89 West: 150.83 East: 150.93 South: -33.99] returned a total of 2,196 records of 46 species.
- Report generated on 15/11/2018 4:13 PM

Table A2 Threatened Species, Populations and Communities and Likelihood of Occurrence

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
PLANTS						
Allocasuarina glareicola	E	E1	A smooth –barked, slender shrub to 2 m high. The species grows in Castlereagh woodland on tertiary, alluvial gravel with yellow clayey subsoil and lateritic soil. Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	-	N	PMST
Asterolasia elegans	E	E1	A tall, thin shrub to 3 m high distinguished by the rusty, star-shaped hairs on both leaf surfaces. Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, may also occur in the western part of Gosford LGA, the species is known from seven known populations. Habitat for the species includes Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.	-	N	PMST
Austral Toadflax *Thesium australe*	V	V	The species occurs in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Habitat for this species includes grassland on coastal headlands or grassland and grassy woodland away from the coast.	-	N	PMST
Bargo Geebung *Persoonia bargoensis*	V	E1	The species occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils of the Wianamatta Shale and Hawkesbury Sandstone. It favours interface soil landscapes.	-	N	BAM-C
Brown Pomaderris *Pomaderris brunnea*	V	E1	Shrub growing up to 3 m tall with distinctly hairy stems. The species occurs in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. Habitat for this species includes moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	-	N	PMST
Buttercup Doubletail *Diuris aequalis*	V	E1,	Terrestrial orchid with distinct yellow flower. Historic records around Sydney. Typically recorded in forest, low open woodland with grassy understorey and secondary grassland on the higher parts of the Southern and Central Tablelands.	1	N	BioNet
Bynoe's Wattle *Acacia bynoeana*	V	E1	The species is endemic to central eastern NSW, currently known from only 30 locations, many of only 1-5 plants. Grows mainly in heath/ dry sclerophyll forest on sandy soils, prefers open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches.	20	L	BioNet PMST BAM-C
Camden White Gum *Eucalyptus benthamii*	V	V	A tall tree with smooth, white bark and numerous flaky ribbons this species occurs on the alluvial flats of the Nepean River and its tributaries. The species requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment.	-	N	BAM-C

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Thick-lipped Spider-orchid *Caladenia tessellata*	E	V	Occurs from Central Coast NSW to southern VIC. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils.	-	L	PMST BAM-C
Dark Greenhood *Pterostylis nigricans*	-	V	Small autumn-flowering ground orchid that grows from a tuber. Occurs in north-east NSW north from Evans Head, and in Queensland. Coastal heathland with Heath Banksia (*Banksia ericifolia*), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soils.	1	N	BioNet
Deane's Paperbark *Melaleuca deanei*	V	V	Shrub to 3 m high with fibrous, flaky bark. The species occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. Habitat for the species is primarily ridgetop woodland, with only 5% of sites in heath on sandstone.	-	N	PMST
Dillwynia tenuifolia	-	V	Low spreading pea-flower shrub to one metre high. The core distribution is the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee. The species occurs in dry sclerophyll woodland with tertiary alluvium soils.	1	N	BioNet BAM-C
Downy Wattle *Acacia pubescens*	V	V	The distribution of this species is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. This species occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	120	M	BioNet PMST BAM-C
Gyrostemon thesioides	-	E1, 3	Small multi-stemmed short-lived shrub best detected within a few months of fire. Grows on hillsides and riverbanks and may be restricted to fine sandy soils.	16	N	BioNet
Hairy Geebung *Persoonia hirsuta*	E	E1, 3	Spreading shrub distinguished by the hairiness of the flowers, branchlets and leaves. The distribution of the species is scattered around Sydney, east to the Blue Mountains and from Singleton in the north to Bargo in the south. The species is found in dry sclerophyll open forest on sandy soils.	1	L	BioNet PMST
Hibbertia fumana	-	E4A	Low shrub or sub-shrub with many branches at the base. Currently only known from a single population at Moorebank but potentially elsewhere in greater Sydney. Generally found in areas of woodland with a more open understorey, in a long intergrade between Castlereagh Scribbly Gum Woodland and Castlereagh Ironbark Forest.	103	N	BioNet
Hibbertia puberula	-	E1	Widespread but uncommon the species inhabits dry sclerophyll woodland communities and heaths. The species distribution extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Flowering occurs from October to January.	644	N	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Illawarra Greenhood *Pterostylis gibbosa*	E	E	This species of ground-dwelling orchid is known from a small number of populations in the Hunter region, the Illawarra region, and the Shoalhaven region in New South Wales. Habitat for this species includes open forest and woodland on flat or gently sloping land.	-	L	PMST
Juniper-leaved Grevillea *Grevillea juniperina* subsp. *juniperina*	-	V	Easily identified medium-sized shrub with green prickly leaves. Endemic to Western Sydney. Occurs on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium.	-	L	BAM-C
Kangaloon Sun Orchid *Thelymitra kangaloonica*	CE		The species is a terrestrial orchid, with a green or purplish flower stem growing 20–56 cm high. The Kangaloon Sun-orchid is endemic to the Central Coast/Tablelands of NSW growing in seasonally swampy sedgeland and on grey silty soil.	-	N	PMST
Leafless Tongue Orchid *Cryptostylis hunteriana*	V	V	The species occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences for this species are not well defined; however it is known to grow in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with *Cryptostylis subulata* and *Cryptostylis erecta*.	-	L	PMST
Matted Bush-pea *Pultenaea pedunculata*	-	E1	Inhabits woodland vegetation but plants have also been found on road batters and coastal cliffs. The species is confined to loamy soils in dry gullies in populations in the Windellama area.	13	L	BioNet BAM-C
Magenta Lilly Pilly *Syzygium paniculatum*	V	E1	The species occurs in a narrow coastal strip from Bulahdelah to Conjola State Forest. Rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests Plants produce white flower-clusters at the end of each branch is the preferred habitat for this species. The petals are small accompanied by prominent long stamens.	-	N	PMST
Narrow-leaved Black Peppermint *Eucalyptus nicholii*	V	V	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	1	L	BioNet
Nodding Geebung *Persoonia nutans*	E	E1	Erect shrub to 2.5 m with flat linear leaves and drooping yellow flowers. The species is restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Habitat for the species includes Woodland to dry sclerophyll forest on laterite and alluvial sand.	164	M	BioNet PMST

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Omeo Stork's-bill *Pelargonium* sp. *striatellum*	E	E	Tufted perennial forb known from only 3 locations in NSW, with two on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. 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.	-	N	PMST
Pimelea curviflora var. *curviflora*	V	-	An erect, open shrub generally growing to 40 cm high, but sometimes up to 50 cm high. The species is confined to the coastal area of the Sydney and Illawarra regions of NSW occurring on ridge tops and upper slopes in open forest and woodland on sandy soil derived from sandstone.	-	N	PMST
Pultenaea parviflora	V	E1	Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.	-	L	PMST
Small-flower Grevillea *Grevillea parviflora subsp. parviflora*	V	V	The species distribution is between Moss Vale/Bargo and the lower Hunter Valley, with most occurrences in Appin, Wedderburn, Picton and Bargo. The habitat for the species is broad including heath, shrubby woodland and open forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks.	601	L	BioNet PMST
Spiked Rice-flower *Pimelea spicata*	E	E1	Small erect or spreading shrub best detected when producing distinctive white/pink tubular flowers from October to May. The species occurs on well-structured clay soils particularly in association with Grey Box woodland and other Cumberland Plain Woodland vegetation types.	13	L	BioNet PMST BAM-C
Square Raspwort *Haloragis exalata* subsp. *exalata*	V	V	A robust, perennial herb distributed from as far north as the Narrabri and south to the Glenelg River in Victoria. Habitat for the species is not well defined however; it appears to require protected and shaded damp situations in riparian habitats.	-	N	PMST
Sydney Plains Greenhood *Pterostylis saxicola*	E	E1	A ground orchid with reddish brown and green translucent flowers on a slender stem to 35 cm tall. The species is restricted to western Sydney between Freemans Reach in the north and Picton in the south. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines.	-	L	PMST BAM-C
Wallangarra White Gum *Eucalyptus scoparia*	V	E1	Small smooth-barked eucalypt with white to pale grey bark. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. The species is found in open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes. A common street tree and planted in parks and gardens.	1	L	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
White-flowered Wax Plant *Cynanchum elegans*	E	E1	The species occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, but may also occur in the western part of Gosford LGA. Habitat for the species includes Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.	-	N	PMST BAM-C
Woronora Beard-heath *Leucopogon exolasius*	V	V	Erect shrub with hanging tubular flowers. The species occurs along the upper Georges River area and in Heathcote National Park where it occupies rocky hillsides in woodland on sandstone. The species prefers rocky hillsides in woodland on sandstone.	1	N	BioNet PMST
Yellow Gnat-orchid *Genoplesium baueri*	E	E	This species is endemic to New South Wales. Distribution of this species is generally within coastal areas from Ulladulla on the south coast to Port Stephens on the mid-north coast. Habitat includes heathland to shrubby woodland on sands or sandy loams or open forest, shrubby forest and heathy forest on well-drained sandy and gravelly soils.	-	N	PMST
BIRDS						
Australasian Bittern *Botaurus poiciloptilus*	E	E1	The species is widespread but uncommon over most NSW except the northwest. Habitat for the species includes permanent freshwater wetlands with tall dense reedbeds particularly *Typha* spp. and *Eleocharis* spp., with adjacent shallow, open water for foraging. Roosting occurs during the day amongst dense reeds or rushes and feeding occurs mainly at night.	-	N	PMST
Australian Painted Snipe *Rostratula australis*	E	E1	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. The species nests on the ground amongst tall reed-like vegetation near water. Habitat for the species includes the fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	-	N	PMST
Barking Owl *Ninox connivens*	-	V	Occurs from coast to inland slopes and plains, though is rare in dense, wet forests east of the Great Dividing Range, higher parts of the tablelands and in the arid zone. Inhabits eucalypt woodlands, open forest, swamp woodlands especially in inland areas along timbered watercourses. Roosts along creek lines in dense, tall understorey foliage (e.g. in Acacia and Casuarina), or dense eucalypt canopy. Nests in hollows of large, old eucalypts. Territories range from 30 to 200 hectares.	1	L	BioNet
Black Falcon *Falco subniger*	-	V	Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling over hundreds of kilometres. The Black Falcon inhabits woodland, shrubland and grassland in the arid and semi-arid zones, especially wooded watercourses and agricultural land with scattered remnant trees.	2	L	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Brown Treecreeper *Climacteris picumnus victoriae*	-	V	Small grey-brown bird with black streaking on the lower breast/belly and black bars on the undertail. Inhabits Box-Gum woodlands and dry open forest of inland slopes and plains. Preferred woodlands dominant by stringybarks or other rough-barked eucalypts. Forages in trees and on the ground. Endemic to eastern Australia, occurring from the coast to inland plains and western slopes of the great dividing range. Nests in tree or stump hollows greater than 6 cm.	-	L	BAM-P
Bush Stone-curlew *Burhinus grallarius*	-	E1	Scattered distribution across NSW. Inhabits lowland grassy woodland and open forest and, in coastal areas, Casuarina and Melaleuca woodlands, saltmarsh and mangroves. Requires a low, sparse groundcover, some fallen timber and leaf litter, and a general lack of a shrubby understory.	3	N	BioNet BAM-C
Curlew Sandpiper *Calidris ferruginea*	CE, M, MR	E1	The species occurs along the entire coast of NSW, particularly in the Hunter Estuary, and freshwater wetlands in the Murray-Darling Basin. Breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales can be found mainly in intertidal mudflats of sheltered coasts.	-	N	PMST
Diamond Firetail *Stagonopleura guttata*	-	V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (*Eucalyptus pauciflora*) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Groups separate into small colonies to breed, between August and January.	-	L	BAM-P
Dusky Woodswallow *Artamus cyanopterus cyanopterus*	-	V	A woodland dependent bird with a wide distribution and occurrence in a variety of habitats. The Tasmanian breeding population migrates north during the cooler months and can be found in southeast NSW. The species is an aerial forager and prefers woodland habitats.	7	L	BioNet BAM-P
Eastern Bristlebird *Dasyornis brachypterus*	E	E1	Occurs in three disjunct areas of southeastern Australia: southern Queensland/northern NSW, the Illawarra Region and in the vicinity of the NSW/Victorian border. Habitat for the species is characterised by dense, low vegetation including heath and open woodland with a heathy understorey.	-	N	PMST
Eastern Curlew *Numenius madagascariensis*	CE		The eastern curlew is Australia's largest shorebird and a long-haul flyer. It is easily recognisable, with its long, down-curved bill. The species takes an annual migratory flight to Russia and northeastern China to breed, arriving back home to Australia in August.	-	N	PMST

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Flame Robin *Petroica phoenicea*	-	V	The species is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. The species prefers habitat with clearings or areas of open understory.	5	L	BioNet BAM-P
Gang-gang Cockatoo *Callocephalon fimbriatum*	-	V	Distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the species is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. 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.	1	L	BioNet BAM-P BAM-C
Hooded Robin *Melanodryas cucullata cucullata*	-	V	Widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. The south-eastern form (subspecies cucullata) is found from Brisbane to Adelaide and throughout much of inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	-	L	BAM-P
Little Eagle *Hieraaetus morphnoides*	-	V	Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	15	L	BioNet BAM-P BAM-C
Little Lorikeet *Glossopsitta pusilla*	-	V	The species occurs from the coast to western slopes of the Great Dividing Range and inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands *Eucalyptus albens* and *E. melliodora* are particularly important food sources for pollen and nectar respectively. Mostly nests in small (opening approx. 30cm) hollows in living, smooth-barked eucalypts, especially *Eucalyptus viminalis*, *E. blakelyi* and *E. dealbata*. Most breeding records are from the western slopes.	11	L	BioNet BAM-P

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Masked Owl *Tyto novaehollandiae*	-	V	Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>30 cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.	-	L	BAM-P BAM-C
Painted Honeyeater *Grantiella picta*	V	V	The species is nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing 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. Habitat for the species includes Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests.	-	L	PMST BAM-P
Powerful Owl *Ninox strenua*	-	V	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 at low densities throughout the eastern forests from the coast inland to tablelands. The species inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest requiring large tracts of forest or woodland habitat.	2	L	BioNet BAM-P BAM-C
Regent Honeyeater *Anthochaera phrygia*	CE	E4A	In NSW the species is confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks are seen occasionally in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests. Habitat for the species includes dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of	-	L	PMST BAM-P BAM-C
Scarlet Robin *Petroica boodang*	-	V	Found from south east Queensland to south east South Australia and also in Tasmania and south west Western Australia. In NSW, it occurs from the coast to the inland slopes. The species lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Habitat usually contains abundant logs and fallen timber.	1	L	BioNet BAM-P
Speckled Warbler *Chthonicola sagittata*	-	V	Within NSW most frequently reported from the hills and tablelands of the Great Dividing Range, rarely from the coast. The species inhabits a wide range of Eucalypt-dominated communities with a grassy understorey, a sparse shrub layer, often on rocky ridges or in gullies. Sedentary and requires large, relatively undisturbed remnants to persist in an area. Forages on the ground for seeds and insects, and nests in a slight hollow in the ground or at the base of low dense plants.	1	L	BioNet BAM-P

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Spotted Harrier *Circus assimilis*	-	V	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).	1	L	BioNet BAM-P
Square-tailed Kite *Lophoictinia isura*	-	V	In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Found in a variety of timbered habitats including dry woodlands and open forests. The species shows a particular preference for timbered watercourses.	-	L	BAM-P BAM-C
Swift Parrot *Lathamus discolor*	CE, MR	E1	A migratory species that travels to the mainland from March to October, the species breeds in Tasmania from September to January. In NSW mostly occurs on the coast and south west slopes. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. *Eucalyptus robusta*, *Corymbia maculata* and C*. gummifera* dominated coastal forests are also important habitat.	1	L	BioNet PMST BAM-P BAM-C
Turquoise Parrot *Neophema pulchella*	-	V	Inhabits fringes of eucalypt woodlands, often adjacent to clearings, ridges and farmland creeks. Typically forages on the ground under trees. Distributed from southern Queensland to northern Victoria, extending from the coast to the western slopes of the Great Dividing Range. Nesting occurs from December to August in tree hollows.	14	L	BioNet BAM-P
Varied Sittella *Daphoenositta chrysoptera*	-	V	Sedentary, occurs across NSW from the coast to the far west. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sensitive to habitat isolation and loss of structural complexity, and adversely affected by dominance of Noisy Miners. Cleared agricultural land is potentially a barrier to movement. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	23	L	BioNet BAM-P
White-bellied Sea-Eagle *Haliaeetus leucogaster*	MR	V	Distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. The species terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).is characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.	1	L	BioNet BAM-P BAM-C
FISH						

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Australian Grayling *Prototroctes maraena*	-	-	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 been recorded over 100 km upstream from the sea.	-	N	PMST
Macquarie Perch *Macquaria australasica*	E	-	A riverine, schooling species, 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). Populations may survive in impoundments if able to access suitable spawning site.	-	N	PMST
Murray Cod *Maccullochella peelii*	V	-	The species lives in a variety of habitats ranging from clear, rocky streams to slow flowing turbid rivers, lakes and billabongs. They are absent from some of the cooler areas such as the upper reaches of the Murray and Murrumbidgee Rivers, preferring warmer waters.	-	N	PMST
AMPHIBIANS						
Giant Burrowing Frog *Heleioporus australiacus*	V	V	The species is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Breeding habitat of this species is generally soaks or pools within first or second order streams.	-	N	PMST
Green and Golden Bell Frog Litoria aurea	V	E1	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Prefers sites containing cumbungi (*Typha* spp.) or spike rushes (*Eleocharis* spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. *Gambusia holbrooki* is a key threat as they feed on green and Golden Bell Frog eggs and tadpoles.	5	N	BioNet PMST BAM-C
Southern Bell Frog *Litoria raniformis*	V	E1	The species exists only in isolated populations in the Coleambally Irrigation Area. Habitat for the species is usually in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys.	-	N	PMST

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
MAMMALS						
Brush-tailed Rock-wallaby *Petrogale penicillata*	E	V	Occurring from Shoalhaven to the Queensland border the species is now mostly extinct west of the Great Dividing Range, except in the Warrumbungles and Mt Kaputar. The species inhabits rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north.	-	N	PMST
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*	-	V	Generally occurs east of the Great Dividing Range along NSW coast. The species inhabits various habitats from open grasslands to woodlands, wet and dry sclerophyll forests and rainforest. Essentially a cave bat but may also roost in road culverts, stormwater tunnels and other man-made structures. There are only 4 known maternity caves in NSW, near Wee Jasper, Bungonia, Kempsey and Texas. Females of this species may travel hundreds of kilometres to the nearest maternal colony.	36	L	BioNet BAM-P BAM-C
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	-	V	The species occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts include hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12 km foraging movements recorded).	8	L	BioNet
Eastern Freetail-bat *Mormopterus norfolkensis*	-	V	The species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Forages in natural and artificial openings in vegetation, typically within a few kilometres of its roost. Roosts primarily in tree hollows but also recorded from man-made structures or under bark.	42	L	BioNet BAM-P
Eastern Pygmy-Possum *Cercartetus nanus*	-	V	In NSW, has been found in mallee shrubland dominated by either spinifex (*Triodia* spp.) or with an understorey of Tea-tree (*Leptospermum* spp.) and also in Belah (*Casuarina pauper*) in mixed woodland with well-developed understorey of saltbush. In other states is also frequently found in woodlands with dense heath understorey (particularly Proteaceae species such as *Banksia* and *Hakea* species).	-	N	BAM-C
Greater Broad-nosed Bat *Scoteanax rueppellii*	-	V	The species is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however does not occur at altitudes above 500 m. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks.	25	L	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Greater Glider *Petauroides volans*	V	-	The species occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Occupy a relatively small home range with an average size of 1 to 3 ha.	-	N	PMST
Grey-headed Flying-fox *Pteropus poliocephalus*	V	V	Generally this species is found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Inhabit subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	56	L	BioNet PMST BAM-P BAM-C
Koala *Phascolarctos cinereus*	V	V	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. Inhabit eucalypt woodlands and forests feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	24	N	BioNet PMST BAM-P BAM-C
Large-eared Pied Bat *Chalinolobus dwyeri*	V	V	The species occurs from the coast to the western slopes of the divide. The largest numbers of records are from sandstone escarpment country in the Sydney Basin and Hunter Valley. The species roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.	-	L	PMST BAM-C
Little Bentwing-bat *Miniopterus australis*	-	V	The species occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Outside breeding season roosts in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. Forages for insects beneath the canopy of well-timbered habitats.	4	L	BioNet BAM-P BAM-C
New Holland Mouse *Pseudomys novaehollandiae*	V	-	The species occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW it inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes. Species presence is strongly correlated with understorey vegetation density, and high floristic diversity in regenerating heath.	-	N	PMST

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Southern Myotis *Myotis macropus*	-	V	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water. The breeding period for this species is November or December.	28	L	BioNet BAM-C
Spotted-tailed Quoll *Dasyurus maculatus*	E	V	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania the species has been 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	1	L	BioNet PMST BAM-P
Squirrel Glider *Petaurus norfolcensis*	-	V	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or *Acacia* midstorey.	1	N	BioNet BAM-C
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	-	V	Migrates from tropics to SE Australia in summer. Forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, *Acacia* shrubland, mallee, grasslands and desert. Seasonal movements are unknown.	3	L	BioNet BAM-P
REPTILES						
Broad-headed Snake *Hoplocephalus bungaroides*	V	E1	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 250 km of Sydney. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.	-	N	PMST
GASTROPODS						
Cumberland Plain Land Snail *Meridolum corneovirens*	-	E1	The species lives in small areas on the Cumberland Plain west of Sydney, from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains. The species inhabits Cumberland Plain Woodland living under a litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish in	167	L	BioNet BAM-C

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Dural Woodland Snail *Pommerhelix duralensis*	E	E1	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 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.	-	N	BAM-C
POPULATIONS						
Marsdenia viridiflora R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas		E2	Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range. Grows in vine thickets and open shale woodland	6	N	BioNet BAM-C
Dillwynia tenuifolia, Kemps Creek		E2	Occurs in the area bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. The site supports a transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland. Portions of the site contain a form of Shale Gravel Transition Forest. Flowering occurs sporadically from August to March.	-	N	BAM-C
COMMUNITIES						
Agnes Banks Woodland in the Sydney Basin Bioregion		E4B	Low woodland dominated by *Eucalyptus sclerophylla* and *Angophora bakeri* with a diverse understorey of sclerophyllous shrubs species including *Banksia oblongifolia*, *Conospermum taxifolium*, *Leptospermum trinervium*, *Dillwynia sericea*, *Monotoca scoparia* and *Persoonia nutans*, and ground stratum species including *Lepidosperma urophorum*, *Platysace ericoides*, *Pimelea linifolia*, *Mitrasacme polymorpha*, *Trachymene incisa* and *Stylidium graminifolium*. Restricted to small areas of sand dunes overlying Tertiary Alluvium at Agnes Banks on the east bank of the Hawkesbury River in the Penrith LGA.		N	BioNet
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions		E3	Associated with coastal sand plains of marine or aeolian origin. It occurs on deep, freely draining to damp sandy soils on flat to moderate slopes within a few km of the sea and at altitudes below 100 m.		N	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Blue Gum High Forest in the Sydney Basin Bioregion		E4B	Blue Gum High Forest is dominated by a tall canopy of eucalypts that may exceed 30 m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns and some grasses. Dominated by either *Eucalyptus pilularis* (Blackbutt) or *E. saligna* (Sydney Blue Gum). Typically associated with soils derived from Wianamatta Shale (Tozer 2003) though may occur in adjacent areas underlain by Hawkesbury Sandston. Found on the north shore and northern suburbs of Sydney and has been recorded from the LGAs of Lane Cove, Willoughby, Ku-ring-gai, Hornsby, Baulkham Hills, Ryde and Parramatta within the Sydney Basin Bioregion and may occur elsewhere in the Bioregion.		N	BioNet
Blue Mountains Shale Cap Forest in the Sydney Basin Bioregion		E3	Blue Mountains Shale Cap Forest is found on deep fertile soils formed on Wianamatta Shale, on moist sheltered sites at lower to middle altitudes of the Blue Mountains and Wollemi areas. Extensive occurrences of shale are at Springwood, Berambing to Kurrajong Heights, Mountain Lagoon and Colo Heights.		N	BioNet
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion		V2	Dominated by *Eucalyptus parramattensis* subsp. *parramattensis*, *Angophora bakeri* and *E. sclerophylla*. Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Occurs within the LGAs of Bankstown, Blacktown, Campbelltown, Hawkesbury, Liverpool and Penrith (James 1997). The main occurrence of Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion is in the Castlereagh area of the Cumberland Plain, with small patches occurring at Kemps Creek and Longneck Lagoon.		N	BioNet
Castlereagh Swamp Woodland Community		E3	Low woodland, often having dense stands of Paperbark trees *Melaleuca decora* along with other canopy trees, such as *Eucalyptus parramattensis*. Occurs in western Sydney in the Castlereagh and Holsworthy areas, on deposits from ancient river systems along today's intermittent creeklines, often in poorly drained depressions. There is now only 616 hectares remaining intact, which mainly occurs in the Hawkesbury, Liverpool and Penrith LGAs.		N	BioNet
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E3	Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea.		N	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Coastal Upland Swamp in the Sydney Basin Bioregion		E3	Occurs primarily on impermeable sandstone plateaus in the headwater valleys of streams and on sandstone benches with abundant seepage moisture. Characterised by highly diverse and variable mosaics of vegetation related to variability in soil conditions and fire regimes. Trees are typically absent from the community, but may be present as scattered individuals or clumps of mallee or arborescent eucalypts.		N	BioNet
Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion		E3	Predominantly open-forest to low woodland structure usually with trees of *Eucalyptus fibrosa* and *Melaleuca decora*, sometimes with *E. longifolia*. Relatively dense shrub stratum is typical, commonly with *M. nodosa* and *Lissanthe strigosa*, and to a lesser extent *M. decora*. Usually occurs on clay soils on Tertiary alluvium, or on shale soils on Wianamatta Shale including the Birrong Soil Landscape and associated shale lowlands. Known to occur in the Auburn, Bankstown, Blacktown, Canterbury, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Strathfield LGAs.		L	BioNet
Cumberland Plain Woodland in the Sydney Basin Bioregion		E4B	Typically comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. Associated with clay soils derived from Wianamatta Group geology, or more rarely alluvial substrates, on the Cumberland Plain. The community typically occurs on flat to undulating or hilly terrain up to about 350 m elevation but may also occur on locally steep sites and at slightly higher elevations. Restricted to the Sydney Basin bioregion and is currently known to occur within the LGAs of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly, but may occur elsewhere within the bioregion.		P	BioNet
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E3	Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, backswamps, lagoons and lakes.		N	BioNet
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E3	Littoral Rainforest is generally a closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. Plant species of this community are predominantly rainforest species. Littoral Rainforest occurs only on the coast.		N	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Moist Shale Woodland in the Sydney Basin Bioregion		E3	Similar to Cumberland plain Woodland, but differs in having a shrub understorey that contains plants from moist habitats. Dominant canopy trees include *Eucalyptus tereticornis*, *E. moluccana*, *E. crebra* and *Corymbia maculata*. Moist Shale Woodland usually occurs on soils derived from Wianamatta Shale on high country in the southern half of the Cumberland Plain, and occurs mainly in Wollondilly LGA.		L	BioNet
O'Hares Creek Shale Forest		E3	Occurs on small outcrops of Hawkesbury shale in the Darkes Forest area of the Woronora Plateau. The community is dominated by *Eucalyptus piperita*, *E. globoidea* and *Angophora costata*, with the latter species sometimes being the dominant canopy species.		N	BioNet
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E3	Occurs on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis, Eucalyptus amplifolia, Angophora floribunda* and *Angophora subvelutina*.		L	BioNet
Shale Gravel Transition Forest in the Sydney Basin Bioregion		E3	Open-forest structure, usually with trees of *Eucalyptus fibrosa* sometimes with *E. moluccana* and *E. tereticornis*. *Melaleuca decora* is frequently present in a small tree stratum. Occurs primarily in areas where shallow deposits of Tertiary alluvium overlie shale soils but may also occur in association with localised concentrations of iron-indurated gravel. Shale Gravel Transition Forest grades into C as alluvial and ironstone influences decline.		L	BioNet
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion		E3	Primarily associated with the heads and upper slopes of sandstone gullies, which are downslope from residual shale or ironstone caps. Dominant trees include *Angophora costata*, *Eucalyptus piperita* and occasionally *E. pilularis*, particularly around Helensburgh. *Corymbia gummifera* occurs frequently within the community, although generally at lower abundance than the other eucalypts. Recorded from the LGAs of Campbelltown, Hurstville, Kogarah, Sutherland, Wollondilly and Wollongong.		N	BioNet

Species Name	EPBC Act	BC Act	Key Information	Records	LoO	Source
Sydney Freshwater Wetlands in the Sydney Basin Bioregion		E3	Mosaic community with considerable variation due to fluctuating water levels and seasonal conditions. Characteristic vegetation is sedges and aquatics particularly *Eleocharis sphacelata*, *Baumea juncea*, *B. rubiginosa*, *B. articulata*, *Gahnia sieberiana*, *Ludwigia peploides* and *Persicaria* species. There may be patches of emergent trees such as *Melaleuca quinquenervia* and shrubs. Restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplain sites in coastal areas. These areas are generally on the sands of the Warriewood and Tuggerah Soil Landscapes. Occurs in the LGAs of Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Woollahra, Waverley, Botany, Rockdale, Randwick, Sutherland and Wollongong.		N	BioNet
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions		E3	Found in the NSW North Coast, Sydney Basin and South East Corner Bioregions, on seacliffs and coastal headlands. Typically closed tussock grassland, but may be open shrubland or open heath with a grassy matrix between the shrubs.		N	BioNet
Western Sydney Dry Rainforest in the Sydney Basin Bioregion		E3	A dry vine scrub community of the Cumberland Plain, western Sydney. Very restricted and occurs most commonly in the far southern section of the Cumberland Plain, in the Razorback Range near Picton. Outlying occurrences have been recorded at Grose Vale and Cattai. Restricted to hilly country where it occurs on the sheltered lower slopes and in gullies.		N	BioNet

APPENDIX B

Flora Data

Table B1 Floristic Data Collected on the Project Site at Prestons in 2018

Growth Form	Scientific Name	Common Name	Plot/ Meander	Cover	Abundance
FBA Plot/ Transect Data					
Epiphyte	*Muellerina eucalyptoides*	Mistletoe	FBA Plot	1	3
Exotic	*Sida rhombifolia*	Paddy's Lucerne	FBA Plot	10	1000
Exotic	*Setaria parviflora*	Pigeon Grass	FBA Plot	2	500
Exotic	*Plantago lanceolata*	Lamb's Tongue	FBA Plot	10	1000
Forb	*Dichondra repens*	Kidney Weed	FBA Plot	0.5	100
High Threat Exotic Species	*Eragrostis curvula*	African Love Grass	FBA Plot	0.5	10
High Threat Exotic Species	*Araujia sericifera*	Moth Vine	FBA Plot	0.25	1
High Threat Exotic Species	*Chloris gayana*	Rhodes Grass	FBA Plot	20	1000
Shrub	*Bursaria spinosa*	Black Thorn	FBA Plot	0.25	1
Tree	*Eucalyptus moluccana*	Grey Box	FBA Plot	20	2
Tree	*Corymbia maculata*	Spotted Gum	FBA Plot	15	10
Tussock Grass	*Rytidosperma* sp.	Wallaby Grass	FBA Plot	1	50
Tussock Grass	*Microlaena stipoides*	Weeping Grass	FBA Plot	5	500
Random Meander					
Exotic	*Callistemon* sp. (Planted)	Red Bottle Brush	Meander	N/A	N/A
Exotic	*Nerium oleander* (Planted)	Oleander	Meander	N/A	N/A
Exotic	*Cupressus* sp. (Planted)	Conifer	Meander	N/A	N/A
Exotic	*Rubus anglocandicans*	Blackberry	Meander	N/A	N/A
Exotic	*Trifolium repens*	White Clover	Meander	N/A	N/A
Exotic	*Ehrharta erecta*	Panic Veldt Grass	Meander	N/A	N/A
Exotic	*Sonchus oleraceus*	Sow Thistle	Meander	N/A	N/A
Exotic	*Conyza bonariensis*	Tall Fleabane	Meander	N/A	N/A
Exotic	*Asteraceae* sp. (Planted)	Daisy Bush	Meander	N/A	N/A
Exotic	*Bidens pilosa*	Cobbler's Pegs	Meander	N/A	N/A
Exotic	*Ricinus communis*	Castor Oil Plant	Meander	N/A	N/A
Exotic	*Cirsium vulgare*	Spear Thistle	Meander	N/A	N/A
Exotic	*Cenchrus clandestinus*	Kikuyu	Meander	N/A	N/A
Exotic	*Vicia sativa*	Narrow-leaved Vetch	Meander	N/A	N/A
Exotic	*Modiola caroliniana*	Red-flowered Mallow	Meander	N/A	N/A
Exotic	*Euphorbia prostrata*	Red Caustic Weed	Meander	N/A	N/A
High Threat Exotic species & Priority Weed	*Lycium ferocissimum*	African Boxthorn	Meander	N/A	N/A
Sedge	*Cyperus gracilis*	Slender Flat Sedge	Meander	N/A	N/A

Growth Form	Scientific Name	Common Name	Plot/ Meander	Cover	Abundance
Shrub	*Acacia decurrens*	Green Wattle	Meander	N/A	N/A
Tree	*Syncarpia glomulifera*	Turpentine	Meander	N/A	N/A
Tree	*Brachychiton acerifolius* (Planted)	Flame Tree	Meander	N/A	N/A
Tree	*Araucaria bidwillii* (Planted)	Bunya Pine	Meander	N/A	N/A
Tree	*Casuarina cunninghamiana* (Planted)	River Oak	Meander	N/A	N/A
Tree	*Eucalyptus punctata*	Grey Gum	Meander	N/A	N/A
Tree	*Angophora costata*	Smooth-barked Apple	Meander	N/A	N/A
Tussock Grass	*Cynodon dactylon*	Couch	Meander	N/A	N/A
BAM Plot Data					
Tree	*Corymbia maculata*	Spotted Gum	Plot 1	40	10
Tree	*Syncarpia glomulifera*	Turpentine	Plot 1	10	1
Tree	*Lagerstroemia indica*	Crepe Myrtle	Plot 1	5	1
Tree	*Callistemon viminalis*	Weeping Bottlebrush	Plot 1	1	1
Shrub	*Nerium oleander*	Oleander	Plot 1	3	1
Tree	*Cupressus sempervirens*	Mediterranean Cypress	Plot 1	3	1
Grass	*Chloris gayana*	Rhodes Grass	Plot 1	1	50
Grass	*Side rhombifolia*	Paddy's Lucerne	Plot 1	2	100
Grass	*Ehrharta erecta*	Panic Veldtgrass	Plot 1	1	50
Sedge	*Bolboschoenus* sp.		Plot 1	0.1	10
Forb	*Senecio madagascariensis*	Fireweed	Plot 1	1	60
Grass	*Lolium perenne*	Perennial Ryegrass	Plot 1	0.5	10
Forb	*Sonchus oleraceus*	Common Sowthistle	Plot 1	0.5	10
Grass	*Setaria pumila*	Pale Pigeon Grass	Plot 1	0.5	20
Other Grass	*Cenchrus clandestinus*	Kikuyu	Plot 1	0.5	50
Forb	*Euphorbia peplus*	Petty Spurge	Plot 1	0.1	10
Grass	*Paspalum dilatatum*	Paspalum	Plot 1	1	50
Forb	*Hypochaeris albiflora*	White Flatweed	Plot 1	0.2	15
Grass	*Dichelachne micrantha*	Shorthair Plumegrass	Plot 1	0.1	5
Forb	*Viola hederacea*	Ivy-leaved Violet	Plot 1	0.5	20
Forb	*Dichondra repens*	Kidney Weed	Plot 1	0.5	50
Grass	*Aristida ramosa*	Purple Wiregrass	Plot 1	0.1	10
Grass	*Microlaena stipoides*	Weeping Grass	Plot 1	0.5	20
Forb	*Einadia hastata*	Berry Saltbush	Plot 1	0.1	20
Forb	*Plantago lanceolata*	Lamb's Tongues	Plot 1	0.2	50
Forb	*Dianella longifolia*	Blue Flax-Lily	Plot 1	0.01	1
Forb	*Brunoniella australis*	Blue Trumpet	Plot 1	0.1	5
Forb	*Nothoscordum gracile*	Onion Weed	Plot 1	0.05	5

Growth Form	Scientific Name	Common Name	Plot/ Meander	Cover	Abundance
Shrub	*Lycium ferocissimum*	African Boxthorn	Plot 1	0.1	1
Tree	*Acacia decurrens*	Black Wattle	Plot 2	0.5	2
Forb	*Tricoryne elatior*	Yellow Autumn-lily	Plot 2	5	1000
Forb	*Verbena bonariensis*	Purpletop	Plot 2	5	50
Grass	*Microlaena stipoides*	Weeping Grass	Plot 2	5	1000
Forb	*Modiola caroliniana*	Red-flower Mallow	Plot 2	1	100
Forb	*Senecio madagascariensis*	Fireweed	Plot 2	2	200
Forb	*Sonchus oleraceus*	Common Sowthistle	Plot 2	2	200
Forb	*Solanum pungetium*	Eastern Nightshade	Plot 2	1	50
Forb	*Entolasia marginata*	Bordered Panic	Plot 2	0.01	5
Grass	*Plantago lanceolata*	Lamb's Tongues	Plot 2	5	1000
Forb	*Cynodon dactylon*	Couch	Plot 2	10	2000
Grass	*Briza maxima*	Quaking Grass	Plot 2	5	1000
Forb	*Vicia sativa*	Vetch	Plot 2	0.1	5
Grass	*Paspalum dilatatum*	Paspalum	Plot 2	20	2000
Forb	*Euphorbia peplus*	Petty Spurge	Plot 2	0.1	10
Grass	*Setaria pumila*	Pale Pigeon Grass	Plot 2	1	1000
Forb	*Hypericum perforatum*	St. John's Wort	Plot 2	10	50
Grass	*Sida rhombifolia*	Paddy's Lucerne	Plot 2	1	100
Forb	*Foeniculum vulgare*	Fennel	Plot 2	0.01	2
Forb	*Cirsium vulgare*	Spear Thistle	Plot 2	0.05	5
Grass	*Aristida ramosa*	Purple Wiregrass	Plot 2	5	20

APPENDIX C

BAM Data Sheets

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Zone ID	Recorders
Logos Prestons	Zone 1	J. Pepper

Date	9/11/18	Plot ID	P1	Plot dimensions	20 x 50m	Photo #
Zone 56S	Datum UTM	IBRA region	SYD in BASIN	Midline bearing from 0 m	275° Magnetic °	
Easting 302448	Northing 6242284					

Vegetation Class	Coastal Valley Grassy Woodland		Confidence: (H) M L
Plant Community Type PCT	849 Forest Red Gum Grey Box Grassy Woodland	EEC: (Y)	Confidence: (H) M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees TG	3
	Shrubs SG	0
	Grasses etc. GG	5
	Forbs FG	6
	Ferns EG	0
	Other OG	0
Sum of Cover of native vascular plants by growth form group	Trees TG	51
	Shrubs SG	0
	Grasses etc. GG	0.8
	Forbs FG	2.1
	Ferns EG	0
	Other OG	0
High Threat Weed cover		4.6

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	—	0
50 – 79 cm	1	0
30 – 49 cm	11	0
20 – 29 cm	11	0
10 – 19 cm	1111	0
5 – 9 cm	1111	0
< 5 cm	111	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2m Tally space	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	30	10	15	10	5	5	0	0	20	85	0	0	0	0	0	0	0	0	0	5
Average of the 5 subplots	14					22					0					1				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour	orange grey	Soil Depth	
Slope	5°-10°	Aspect	West	Site Drainage	none	Distance to nearest water and type	7100m

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	R	
Cultivation (inc. pasture)	—	—	
Soil erosion	2	R	
Firewood / CWD removal	—	—	
Grazing (identify native/stock)	2	R	recent obs, cleared grassland, adj. land
Fire damage	—	—	
Storm damage	—	—	
Weediness	3	R	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 09/11/18	Logos Prestons	P01	J. Pepper

	GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
TG	t(TG)	1	Corymbia maculata	N	40	10	T	cap
TG	t	2	Syncarpia glomulifera	N	10	1	T	
~~TG~~	t	3	Lagerostroema indica (Crepe Myrtle)	E	5	1	T	
~~TG~~	t	4	Callistemon viminalis	N	1	1	T	
~~SG~~	s	5	~~Oleander~~ Nerium oleander (Oleander)	E	3	1	S	
~~TG~~	t	6	Cupressus sempivirens *	E	3	1	T	
		7						
GG	grass	8	Chloris guyana	HTE	~~5~~ 1	~~50~~		
GG	g	9	Sida rhombifolia	E	2	100		
GG	g	10	Ehrharta erecta	HTE	1	50		
GG	g	11	Bolboschoenus (?) fluviatilis (?)	N	0.1	10		
FG	f	12	Senecio madagascariensis	HTE	1	60		
GG	g	13	Lolium perenne	E	0.5	10		
FG	f	14	Sonchus oleraceus	E	0.5	10		
GG	g	15	Setaria (?) plumila	E	0.5	20		
GG	g	16	Cenchrus clandestinum (Kikuya)	HTE	0.5	50		
FG	f	17	Euphorbia peplus (Petty Spurge)	E	0.1	10		
GG	g	18	Paspalum dilatatum	HTE	1	50		
FG	f	19	Hypochaeris albiflora (white-flower daisy)	N	0.2	15		S
GG	g	20	Dichelachne micrantha	N	0.1	5		
FG	f	21	Viola hederacea	N	0.5	20		
FG	f	22	Dichondra repens	N	0.5	50		
GG	g	23	Aristida (?) ramosa	N	0.1	10		S
GG	g	24	Microlaena stipoides	N	0.5	20		
FG	f	25	Einadia hastata	N	0.1	20		
FG	f	26	Plantago lanceolata ~~grass~~	E	0.2	50		
GG	g	27	Aristida ramosa (grass)	N	0.05	50		S
GG	g	28	(grass)	N	0.05	50		S
FG	f	29	Dianella longifolia	N	0.01	1		
FG	f	30	Brunoniella australis	N	~~0.1~~	5		
FG	f	31	Nothoscordum inodorum (onion weed)	E	0.05	5		
SG	s	32	Lycium ferocissimum (African Boxthorn)	HTE	0.1	1		
		33						
		34						
		35						
		36						
		37						
		38						
		39						
		40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Zone ID	Recorders
Logos	Zone 2	J. Pepper

Date	Zone	Datum	Plot ID	Plot dimensions	Photo #
09/11/18	56		P02	20x50m	

Easting	Northing	IBRA region	Midline bearing from 0 m
302475	6242316	Sydney	225° Magnetic °

		Confidence:
Vegetation Class	Coastal Valley Grassy Woodland	H (M) L
Plant Community Type	? (PCT 849) Low / Exotic — EEC: (N)	Confidence: (H) M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	0
	Grasses etc.	4
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0.5
	Shrubs	0
	Grasses etc.	20.01
	Forbs	6
	Ferns	0
	Other	0
High Threat Weed cover		32

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	–	–
50 – 79 cm	–	–
30 – 49 cm	–	–
20 – 29 cm	–	–
10 – 19 cm	–	–
5 – 9 cm	1	–
< 5 cm	1	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0m Tally space	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	a 1 b 0 c 1 d 0 e 0	a 10 b 2 c 30/20 d 40 e 20	a 0 b 0 c 0 d 1 e 0	a 0 b 0 c 0 d 0 e 0
Average of the 5 subplots	0.4	24	0.2	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	R	majority cleared
Cultivation (inc. pasture)	3	R	furrows running east-west 1m apart
Soil erosion	1	R	
Firewood / CWD removal	–	–	
Grazing (identify native/stock)	2	R	previously grazed
Fire damage	–	–	
Storm damage	–	–	
Weediness	3	R	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 09 / 11 / 18	Logos	P02	J. Pepper

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	Acacia decurrans	N	0.5	2	T	
	2						
FG	3	Trichoryne elatior (?)	N	5	1000		S
FG	4	Verbena (?) bonariensis	E	5	50		
GG	5	Microlaena stipoides	N	5	1000		
FG	6	Modiola caroliniana (Red-flower Mallow)	E	1	100		
FG	7	Senecio madagascariensis	HTE	2	200		
FG	8	Sonchus oleraceas	E	2	200		
FG	9	Solanum (?) pungetium	N	1	50		
GG	10	Entolasia marginata	N	0.01	5		
FG	11	Plantago lanceolata	E	5	1000		
GG	12	Cynodon dactylon	N	10	2000		
GG	13	Briza (?) major	E	5	1000		
FG	14	Vitia sativa (Vetch)	E	0.1	5		
GG	15	Paspalum dilatatum	HTE	20	2000		
FG	16	Euphorbia peplus	E	0.1	10		
GG	17	Setaria (?) pumila	E	1	1000		
SG	18	Hypericum perforatum St Johns Wort	(HTE)	10	50		
GG	19	Sida rhombifolia	E	1	100		
FG	20	Foeniculum vulgare (Fennel)	E	0.01	2		
FG	21	Circium vulgare	E	0.05	5		
GG	22	Botriochloa sp. (?) Aristida ramosa (Chloris??)	N	5	20		S
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

APPENDIX D

PCT 849 Profile

VIS Classification - Community Profile Report

Plant Community Type ID (PCT ID): 849

PCT Classification Confidence Level: High

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

PCT Common Usage Name: Cumberland shale plains woodland

PCT Scientific Name: *Eucalyptus moluccana , Eucalyptus tereticornis / Bursaria spinosa subsp. spinosa / Dichondra repens , Cheilanthes sieberi subsp. sieberi , Aristida vagans , Microlaena stipoides var. stipoides*

Data Entry Operator: System ***Data Entry Date:*** 27/06/2011

Last Modified By: MURPHYDY ***Last Modified Date:*** 03/12/2014

Vegetation Description: The gentle topography associated with the shale plains of western Sydney carries an open grassy woodland dominated by grey box (Eucalyptus moluccana), forest red gum (Eucalyptus tereticornis) and ironbark (Eucalyptus crebra/Eucalyptus fibrosa). Localised patches of spotted gum (Corymbia maculata) may occur in the Fairfield LGA. Cumberland Shale Plains Woodland is the second of the grassy woodlands that comprise the Cumberland Plain Woodland in the Sydney Basin Bioregion Critically Endangered Ecological Community listed under the NSW TSC Act. Like the related community Cumberland Shale Hills Woodland (S_GW02) it is typified by a sparse to moderate cover of shrubs and a high cover of grasses and forbs. Tozer et al. (2010) define the primary habitat for the community as occurring at elevations less than 150 meters above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. The community occupies the north-west and west zones of the study area but is widespread elsewhere across the Cumberland Plain.

Rain fall: Not Assessed

Elevation: Not Assessed

Emergent species: None

Upper Stratum Species: Eucalyptus moluccana; Eucalyptus tereticornis;

Mid Stratum Species: Bursaria spinosa subsp. spinosa;

Ground Stratum Species: Dichondra repens; Cheilanthes sieberi subsp. sieberi; Aristida vagans; Microlaena stipoides var. stipoides; Themeda australis; Brunoniella australis; Desmodium gunnii; Opercularia diphylla; Wahlenbergia gracilis; Dichelachne micrantha; Paspalidium distans; Eragrostis leptostachya; Lomandra filiformis; Lomandra multiflora; Dianella longifolia; Oxalis perennans; Euchiton sphaericus; Goodenia hederacea; Aristida ramosa; Arthropodium milleflorum; Austrodanthonia tenuior; Cymbopogon refractus; Echinopogon caespitosus;

Tree Growth Form Species:

Shrub Growth Form Species:

Grass and grasslike Growth Form Species:

Forb Growth Form Species:

Fern Growth Form Species:

Other Growth Form Species:

Diagnostic Species: Not Assessed

Height Class (Walker & Hopkins 1990): Not Assessed

Vegetation Formation: Grassy Woodlands;

Vegetation Class: Coastal Valley Grassy Woodlands;

NSW Landscape Name: Not Assessed

Classification source:

Authority: PADACS - archive

Pre-European Mapped Or Modelled: Not Assessed

Current Extent Mapped Or Modelled: Not Assessed

Adequacy of plot sampling: None ***Number of Plots:*** Not Assessed

IBRA Bioregion: Sydney Basin (>70%);

IBRA Sub-Region: Yengo (Not known); Cumberland (Not known); Burragorang (Not known); Sydney Cataract (Not known);

LGA: Hawkesbury (Not known); Blue Mountains (Not known); Wollondilly (Not known);

Lithology: Not Assessed

Landform Pattern: Not Assessed

Landform Element: Not Assessed

Pre-European Extent: 44000 ha ?%. Modelled from sound site or polygon data

Pre-European Extent Accuracy: Not Assessed

Pre-European Comments:

Current Extent: Not Assessed

Current Extent Accuracy: Not Assessed

Current Extent Comments:

PCT Percent Cleared: 93.00 ***% accuracy (of PCT % cleared estimate):*** Not Assessed

Variation and Natural Disturbance:

Fire Regime:

PCT associated with TEC: Yes

Associated TEC Names: Listed TSC Act,CE: Cumberland Plain Woodland in the Sydney Basin Bioregion (Equivalent) wholly subset of; Listed EPBC Act,CE: Cumberland Plain Woodland in the Sydney Basin Bioregion (Equivalent) wholly subset of;

Associated TEC Degree of Fit:

Associated TEC Comments:

Citations: (Tozer M. et al., 2010)

Full Reference Details: (854;). Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., 2010 Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0;

Profile source: GW p29 (Tozer et al. 2006);

PCT Definition Status: Approved

APPENDIX E

Fauna Data

Notes	
Key	
Symbol	**Description**
O	Observed
H	Heard
*	Exotic (not native to Australia)
P	Protected (BC Act)

Common Name	Scientific Name	Status	Observation Type
Birds			
Australian Magpie	*Gymnorhina tibicen*	P	O H
Australian Raven	*Corvus coronoides*	P	O H
Black-shouldered Kite	*Elanus axillaris*	P	O
Cattle Egret	*Ardea ibis*	P	O
Common Myna *	*Acridotheres tristis*	*	O H
Common Starling *	*Sturnus vulgaris*	*	O H
Crested Pigeon	*Ocyphaps lophotes*	P	O H
Eastern Rosella	*Platycercus eximius*	P	O H
Little Corella	*Cacatua sanguinea*	P	O H
Magpie-lark	*Grallina cyanoleuca*	P	O H
Masked Lapwing	*Vanellus miles*	P	O
Noisy Miner	*Manorina melanocephala*	P	O H
Welcome Swallow*	*Hirundo neoxena*	*	O
Willie Wagtail	*Rhipidura leucophrys*	P	O H
Mammals			
Brown Hare *	*Lepus lepus*		O
Reptiles			
Cream-striped Shining Skink	*Cryptoblepharus virgatus*	P	O
Amphibians			

APPENDIX F

BAM Calculator Reports

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00013133/BAAS17104/18/00013134	Logos MOD 6 Prestons	07/11/2018
Assessor Name	Report Created	BAM Data version *
Jeremy Pepper	22/11/2018	4
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17104		

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

Common Name	Scientific Name	Vegetation Types(s)
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Diamond Firetail	Stagonopleura guttata	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Eastern Bentwing-bat	Miniopterus schreibersii oceanensis	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Eastern Freetail-bat	Mormopterus norfolkensis	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Flame Robin	Petroica phoenicea	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Gang-gang Cockatoo	Callocephalon fimbriatum	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Koala	Phascolarctos cinereus	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Little Bentwing-bat	Miniopterus australis	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

BAM Predicted Species Report

Little Eagle	Hieraaetus morphnoides	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Little Lorikeet	Glossopsitta pusilla	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Masked Owl	Tyto novaehollandiae	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Painted Honeyeater	Grantiella picta	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Powerful Owl	Ninox strenua	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Regent Honeyeater	Anthochaera phrygia	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Scarlet Robin	Petroica boodang	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Speckled Warbler	Chthonicola sagittata	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Spotted Harrier	Circus assimilis	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Square-tailed Kite	Lophoictinia isura	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Swift Parrot	Lathamus discolor	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Turquoise Parrot	Neophema pulchella	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Varied Sittella	Daphoenositta chrysoptera	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	849-Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

BAM Candidate Species Report

Proposal Details

Assessment Id
00013133/BAAS17104/18/00013134

Proposal Name
Logos MOD 6 Prestons

BAM data last updated *
07/11/2018

Assessor Name
Jeremy Pepper

Report Created
22/11/2018

BAM Data version *
4

Assessor Number
BAAS17104

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

List of Species Requiring Survey

Name	Presence	Survey Months
Acacia pubescens Downy Wattle	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Caladenia tessellata Thick Lip Spider Orchid	No (surveyed)	
Meridolum corneovirens Cumberland Plain Land Snail	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Dillwynia tenuifolia Dillwynia tenuifolia	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Grevillea juniperina subsp. juniperina Juniper-leaved Grevillea	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Pimelea spicata Spiked Rice-flower	No (surveyed)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Pultenaea pedunculata Matted Bush-pea	No (surveyed)	Sep Oct Nov

BAM Candidate Species Report

List of Species Not On Site

Name
Acacia bynoeana Bynoe's Wattle
Burhinus grallarius Bush Stone-curlew
Cercartetus nanus Eastern Pygmy-possum
Chalinolobus dwyeri Large-eared Pied Bat
Lathamus discolor Swift Parrot
Litoria aurea Green and Golden Bell Frog
Lophoictinia isura Square-tailed Kite
Haliaeetus leucogaster White-bellied Sea-Eagle
Marsdenia viridiflora subsp. viridiflora - endangered population Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas
Miniopterus australis Little Bentwing-bat
Persoonia bargoensis Bargo Geebung
Miniopterus schreibersii oceanensis Eastern Bentwing-bat
Myotis macropus Southern Myotis
Ninox strenua Powerful Owl
Petaurus norfolcensis Squirrel Glider
Phascolarctos cinereus Koala
Pteropus poliocephalus Grey-headed Flying-fox
Pterostylis saxicola Sydney Plains Greenhood
Tyto novaehollandiae Masked Owl
Anthochaera phrygia Regent Honeyeater
Callocephalon fimbriatum Gang-gang Cockatoo
Hieraaetus morphnoides Little Eagle
Cynanchum elegans White-flowered Wax Plant
Eucalyptus benthamii Camden White Gum
Pommerhelix duralensis Dural Woodland Snail
Dillwynia tenuifolia - endangered population Dillwynia tenuifolia, Kemps Creek

Pimelea curviflora var. curviflora Pimelea curviflora var. curviflora
Thesium australe Austral Toadflax

BAM Credit Summary Report

Proposal Details

Assessment Id
00013133/BAAS17104/18/00013134

Proposal Name
Logos MOD 6 Prestons

BAM data last updated *
07/11/2018

Assessor Name
Jeremy Pepper

Report Created
15/11/2018

BAM Data version *
4

Assessor Number
BAAS17104

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

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAII	Ecosystem credits
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion								
1	849_Mod-good	34.6	0.2	0.25	High Sensitivity to Potential Gain	2.50	TRUE	3
2	849_Low	13.6	1.9	0.25	High Sensitivity to Potential Gain	2.50	TRUE	0
							Subtotal	**3**
							Total	**3**

BAM Credit Summary Report

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAII	Species credits

Biodiversity payment summary report

Assessment Id	Payment data version	Revision number	Report created
00013133/BAAS17104/18/00013134	41	0	15/11/2018

PCT list

Include	PCT common name	Credits
Yes	**849 -** Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	3

Species list

Include	Species	Credits

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

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Cumberland	**849 -** Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion **Note: This PCT has trades recorded**	$ 25,000.00	0.10629000	8.78398700	33.10%	$49.80	1.0000	$ 25,545.81	3	$76,637.44

Subtotal (excl. GST) **$76,637.44**

Biodiversity payment summary report

	GST	**$7,663.74**
	Total ecosystem credits (incl. GST)	**$84,301.18**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price

No species available

	Grand total	**$84,301.18**

APPENDIX G

PMST Search Report

Australian Government
Department of the Environment and Energy

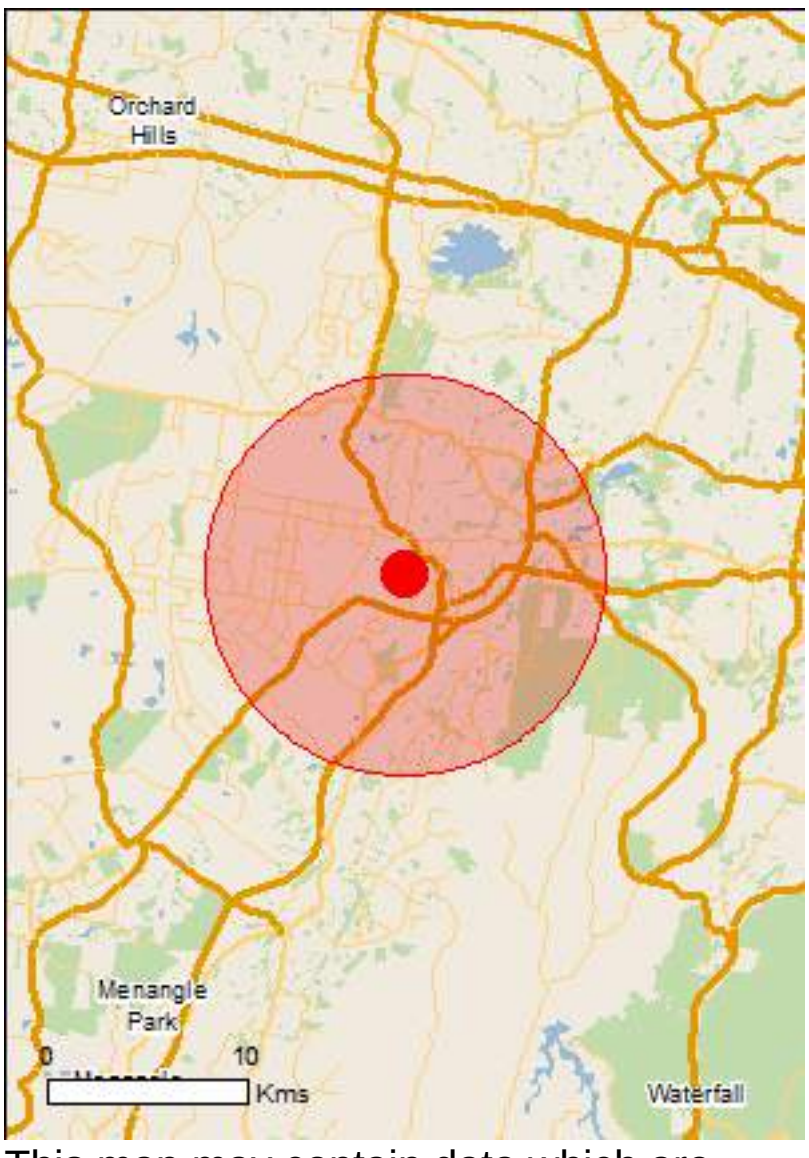
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 15/11/18 16:41:19



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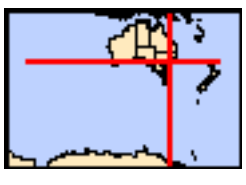

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	8
Listed Threatened Species:	47
Listed Migratory Species:	16

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	14
Commonwealth Heritage Places:	1
Listed Marine Species:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	50
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community may occur within area
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered	Community likely to occur within area
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Rostratula australis		
Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat known to occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Frogs		
Heleioporus australiacus		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni		
Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acacia bynoeana		
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Acacia pubescens		
Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Allocasuarina glareicola [21932]	Endangered	Species or species habitat may occur within area
Asterolasia elegans [56780]	Endangered	Species or species habitat likely to occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat likely to occur within area
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Leucopogon exolasius Woronora Beard-heath [14251]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat likely to occur within area
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Stork's-bill [84065]	Endangered	Species or species habitat may occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat likely to occur within area
Persoonia nutans Nodding Geebung [18119]	Endangered	Species or species habitat likely to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat likely to occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat known to occur within area
Pomaderris brunnea Rufous Pomaderris [16845]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Pultenaea parviflora [19380]	Vulnerable	Species or species habitat known to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra kangaloonica Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Australian Telecommunications Corporation
Commonwealth Land - Commonwealth Trading Bank of Australia
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Commonwealth Land - Telstra Corporation Limited
Defence - INGLEBURN AREA (Bardia Barracks)
Defence - MOOREBANK AREA INC SME
Defence - Suite 8, Library Plaza
Defence - WET BRIDGING SITE - CASULA

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Indigenous		
Cubbitch Barta National Estate Area	NSW	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Chrysococcyx osculans](#) Black-eared Cuckoo [705]		Species or species habitat known to occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
[Hirundapus caudacutus](#) White-throated Needletail [682]		Species or species habitat known to occur within area
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat known to occur within area
[Monarcha trivirgatus](#) Spectacled Monarch [610]		Species or species habitat known to occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat likely to occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
[Rostratula benghalensis (sensu lato)](#) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Edmondson	NSW
Kemps Creek	NSW
Leacock	NSW

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern,		Species or species

Name	Status	Type of Presence
Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus asparagoides		habitat likely to occur within area
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473] Asparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Chrysanthemoides monilifera		Species or species habitat likely to occur within area
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Lycium ferocissimum		Species or species habitat likely to occur within area
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead		Species or species

Name	Status	Type of Presence
[68483]		habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus		
Gorse, Furze [7693]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.94049 150.86195

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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