LANDCOM

JUNE 2020

# BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

## HILLS SHOWGROUND STATION PRECINCT

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# Biodiversity Development Assessment Report
# Hills Showground Station Precinct

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# GLOSSARY

| | |
|---|---|
| BAM | Biodiversity Assessment Method 2017 that supports the *Biodiversity Conservation Act 2016.* |
| BAM Credit Calculator | The computer program that provides decision support to assessors and proponents by applying the BAM, in particular by using the data required to be entered and the equations in Appendix 6 and Appendix 9 to calculate the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site. |
| 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. |
| Site | An area of land that is subject to a proposed development application, application for approval. |
| Candidate species | Species assessed as having a moderate to high likelihood of occurrence within the site. |
| Ecological community | An assemblage of species occupying a particular area. |
| Ecosystem credit | 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 site and the gain in biodiversity values at a biodiversity stewardship site. |
| Environmental weed | Any plant that is not native to a local area that has invaded native vegetation. |
| Exotic | Introduced from outside the area (Stralberg, et al. 2009). Used in the context of this report to refer to species introduced from overseas. |
| Habitat | An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic components. |
| High Threat Weed | Vascular plants not native to Australia that if not controlled will invade and outcompete native species. A list of high threat weeds is available as part of the BAM Calculator (https://www.lmbc.nsw.gov.au/bamcalc) |
| Hollow bearing tree | A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles. |
| IBRA region | A bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes. |

| | |
|---|---|
| IBRA subregion | A subregion of a bioregion identified under the IBRA system. |
| Introduced | Not native to the area: not indigenous (Stralberg, et al. 2009). Refers to both exotic and non-indigenous Australian native species of plants and animals. |
| Landscape attributes | In relation to a site or a biodiversity stewardship site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biodiversity stewardship site. |
| Likely | Taken to be a real chance or possibility (Department of Environment and Conservation 2004). |
| Local population | The population that occurs within the site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated. |
| Locality | The area within a 10 kilometre radius of the site. |
| Minimise | A process applied throughout the development planning and design life cycle which seeks to reduce the residual impacts of development on biodiversity values. |
| Mitchell landscape | Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000. |
| Patch size | An area of intact native vegetation that:<br>a) occurs on the site or biodiversity stewardship site, and<br>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).<br>Patch size may extend onto adjoining land that is not part of the site or biodiversity stewardship site. |
| Plant community type (PCT) | A NSW plant community type identified using the PCT classification system. |
| Priority Weeds | An introduced species listed under the *Biosecurity Act 2015*. Under the Act, priority weeds have specific control measures for each region. |
| Protected species | Those species defined as protected under the *National Parks and Wildlife Act 1974*. Includes all native animals, as well as all native plants listed on Schedule 13 of the *National Parks and Wildlife Act 1974*. |
| Region | A bioregion defined in a national system of bioregionalisation. The Proposal is located within the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995). |
| Significant | Important, weighty or more than ordinary |
| Site | The Hills Showground Station Precinct boundary as identified in the SRDP SEPP and includes the areas detailed in Table 1.1. The site has a total area of 8.4 hectares. |
| Species credit | 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. |
| Threatened biodiversity | Threatened species, populations or ecological communities as listed under the BC Act, FM Act or the EPBC Act. |

# ABBREVIATIONS

| | |
|---|---|
| BDAR | Biodiversity Development Assessment Report |
| BAM | Biodiversity Assessment Method 2017 |
| BC Act | *Biodiversity Conservation Act 2016* |
| BC Regulation | *The NSW Biodiversity Conservation Regulation 2017* |
| BOS | Biodiversity Offset Scheme |
| CAMBA | China Australia Migratory Bird Agreement |
| DPIE | Department of Planning, Industry and Environment (includes the Office of Environment and Heritage) |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EP&A Regulation | *Environmental Planning and Assessment Regulation 2000* |
| ha | Hectares |
| IBRA | Interim Biogeographic Regionalisation for Australia |
| ISEPP | *State Environmental Planning Policy (Infrastructure) 2007* |
| JAMBA | Japan Australia Migratory Bird Agreement |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| MNES | Matters of National Environmental Significance |
| NSW | New South Wales |
| OEH | Office of Environment & Heritage now included within the Department of Planning, Industry and Environment |
| PCT | Plant Community Type |
| RoKAMBA | Republic of Korea Australia Migratory Bird Agreement |
| RMS | NSW Roads and Maritime Services |
| SAII | Serious and Irreversible Impact |
| SEPP | *State Environmental Planning Policy* |
| SEPP 55 | *State Environmental Planning Policy No. 55 - Remediation of Land* |
| SEPP SRD | *State Environment Planning Policy (State and Regional Development) 2011* |
| sqm | Square Metres |
| SSD | State Significant Development |
| TEC | Threatened Ecological Community |

# EXECUTIVE SUMMARY

This Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the NSW Biodiversity Assessment Method 2017 (BAM) established under the *Biodiversity Conservation Act 2016* (BC Act) to support a Concept development application (DA) under Section 4.22 of the *Environmental Planning and Assessment Act 1979 (EP&A Act)*.

The concept for which approval is sought (the 'Revised Concept Proposal') is for a high-density mixed-use precinct with a new public park and plaza, and associated facilities on land located within the Hills Showground Station Precinct (the 'Site') on development lots (Lot 53, Lot 55 and 56 in DP 1253217) (the 'DA Area').

No remnant native vegetation or associated Plant Community Types (PCTs) were recorded in the Hills Showground Station Precinct. The absence of any remnant native vegetation is the result of clearing for previously approved urban development.

One non-native vegetation type was recorded within the Hills Showground Station Precinct, being:

- Miscellaneous ecosystem – urban exotic / native landscape plantings

No threatened flora species, ecological communities or their habitat, listed under the BC Act, have been determined to be affected by the concept proposal. One threatened fauna species being the Grey-headed Flying-fox was recorded flying over the adjoining Cattai Creek to the west of the Hills Showground Station Precinct.

No direct impacts will result on any remnant native vegetation or associated PCTs within the development lot - precinct east. The concept proposal has the potential to have indirect impacts to Cattai Creek which occurs to the west of the Hills Showground Station Precinct. These potential indirect impacts include stormwater runoff and the transport of weeds. Mitigation measures will be implemented, and the indirect impacts will be minor.

Given the concept proposal will not have any direct impacts on PCTs and only minor impacts upon the adjoining Cattai Creek the Biodiversity Offset Scheme (BOS) is not applicable for this development.

The development is considered unlikely to result in a significant impact on any Matters of National Environmental Significance (MNES). Given this, a referral of this development under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to the Department of the Environment and Energy is not warranted.

# 1 INTRODUCTION

WSP has been commissioned by Landcom to prepare this Biodiversity Development Assessment Report (BDAR) in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs), on behalf of Sydney Metro.

Specifically, this BDAR has been prepared in accordance with the Biodiversity Assessment Method 2017 (BAM) and addresses legislative matters prescribed under the BC Act and *Biodiversity Conservation Regulation 2017*, and submissions received during the public exhibition period of the Concept SSDA.

## 1.1 OVERVIEW

This Biodiversity Development Assessment Report (BDAR) has been prepared in accordance with the NSW Biodiversity Assessment Method 2017 (BAM) established under the *Biodiversity Conservation Act 2016* (BC Act) to support a Concept development application (DA) under Section 4.22 of the *Environmental Planning and Assessment Act 1979 (EP&A Act)*.

The concept for which approval is sought (the 'Revised Concept Proposal') is for a high-density mixed-use precinct with a new public park and plaza, and associated facilities on land located within the Hills Showground Station Precinct (the 'Site') on development lots (Lot 53, Lot 55 and 56 in DP 1253217) (the 'DA Area') (Refer Figure 1.1).

The Revised Concept Proposal comprises residential and non-residential land uses and building envelopes of varying heights from three (12m) to up to twenty-one storeys (68m). The proposal also includes a new road, landscaping, services and the provision of publicly accessible open space in the form of Doran Drive Plaza and a park. The Revised Concept Proposal comprises a total gross floor area (GFA) of 166,486m2 across all three development lots.

The Revised Concept Proposal meets the criteria to be declared a State Significant Development (SSD) under State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP).

## 1.2 SITE DESCRIPTION

### *1.2.1 HILLS SHOWGROUND STATION PRECINCT*

The term 'the Site' reflects the Hills Showground Station Precinct boundary identified in the SRDP SEPP and includes the areas detailed in Table 1.1 and illustrated in Figure 1.1. The Site has a total area of 8.4 hectares.

Table 1.1 Hills Showground Station

| EXISTING USE | LEGAL DESCRIPTION | ADDRESS |
|---|---|---|
| Sydney Metro commuter carpark and plaza | Lot 52 1253217 | 3 De Clambe Drive, Castle Hill |
| Development lot – Hills Showground Precinct West | Lot 53 DP 1253217 | 5 De Clambe Drive, Castle Hill |
| Development lot – Doran Drive Precinct | Lot 55 DP 1253217 | 2 Mandala Parade Castle Hill |
| Development lot – Hills Showground Precinct East | Lot 56 DP 1253217 | 3 Andalusian Way, Castle Hill |
| Hills Showground Station Box and service facility boxes | Lot 54 & Lot 50 1253217 | 1 Mandala Parade, Castle Hill |

| EXISTING USE | LEGAL DESCRIPTION | ADDRESS |
|---|---|---|
| Mandala Parade, De Clambe Drive, Doran Drive, Andalusian Way | N/A | N/A |

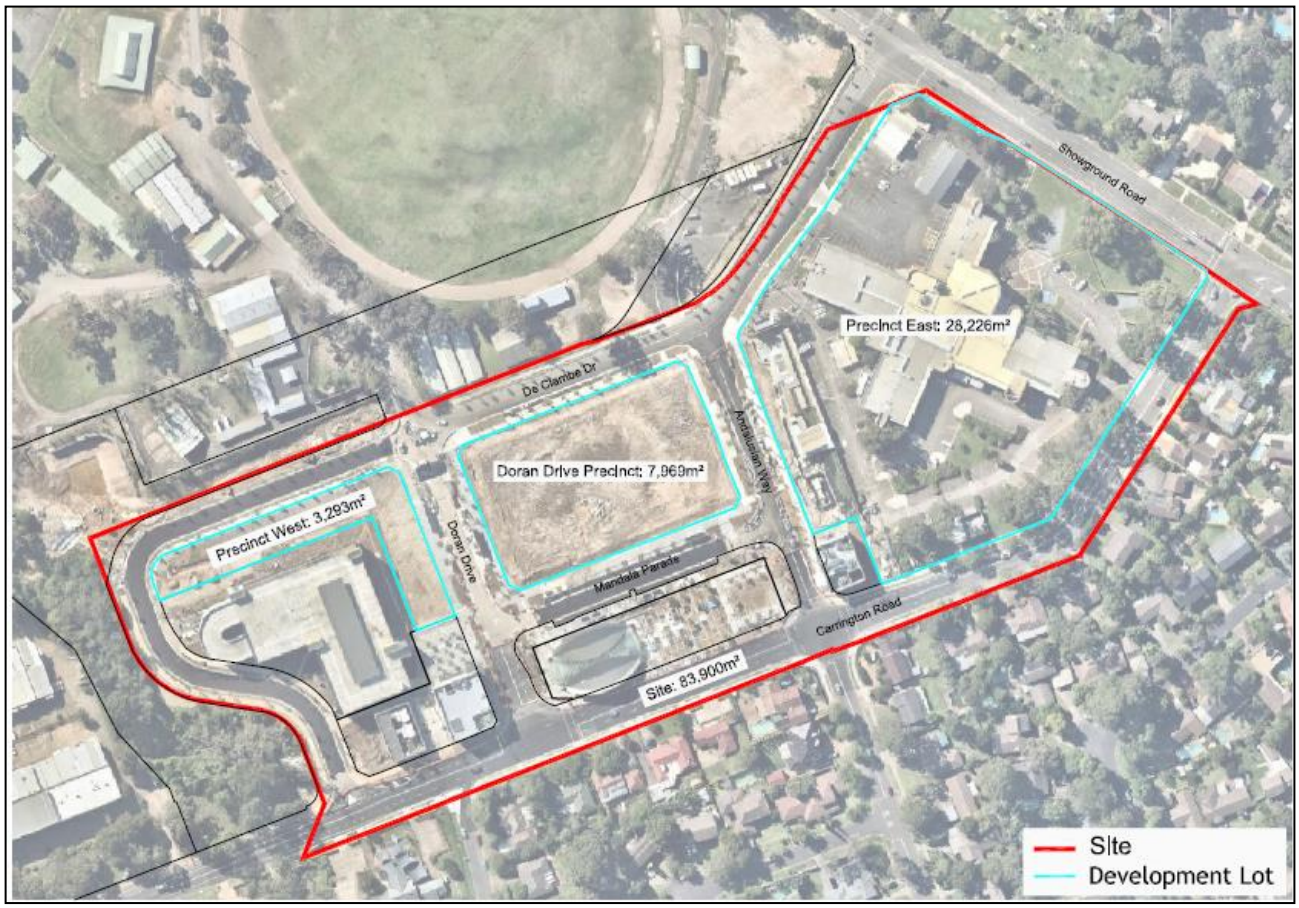



Figure 1.1 The Hills Showground Station Precinct (The Site)

*Source: Cox Architecture 2019*

The eastern part of the Site (Hills Showground Station Precinct East – Lot 56 DP 1253217) currently contains the former Council administration building and associated parking and landscaping. It was being used as a Sydney Metro's construction site office but is being demolished by way of a separate DA (304/2020/LA).

The western part of the Site contains the recently opened Hills Showground Metro Station, plaza and commuter car park. The remainder was cleared to create the two development lots (Lots 53 and Lot 55 DP 1253217) and the roads listed in the table above.

Former development on the western part of the Site consisted of The Hills Entertainment Centre which included an Auditorium and Council's works depot that were demolished to make way for the metro.

The Site is bordered by the following:

- North and northwest – De Clambe Drive with a drainage basin and the Castle Hill Showground further north
- West – De Clambe Drive and Cattai Creek riparian zone with commercial/industrial warehouses further west
- South to southeast – Carrington Road across which are low density residential developments, a child care and medical/physiotherapy
- East – Showground Road across which are low density residential development.

### 1.2.2 HILLS SHOWGROUND STATION DEVELOPMENT LOTS (DA AREA)

The Revised Concept Proposal relates to the three development lots detailed in Figure 1.1 and Table 1.2 and referred to herein as the 'DA Area'. This land is currently owned by Sydney Metro.

Table 1.2 Hills Showground Station Precincts

| PRECINCT NAME | LEGAL DESCRIPTION | ADDRESS | DESCRIPTION OF EXISTING DEVELOPMENT | PRECINCT AREA (M2) |
|---|---|---|---|---|
| Hills Showground Precinct West | Lot 53 DP 1253217 | 5 De Clambe Drive, Castle Hill | L shaped vacant lot with existing stormwater drainage easement on the portion adjacent to De Clambe Drive. | 3,293 |
| Doran Drive Precinct | Lot 55 DP 1253217 | 2 Mandala Parade, Castle Hill | Rectangular vacant lot with no vegetation. | 7,969 |
| Hills Showground Precinct East | Lot 56 DP 1253217 | 3 Andalusian Way, Castle Hill | Former two storey Council administration building and associated parking and landscaping. | 28,226 |

## 1.3 PLANNING CONTEXT

The Site is located in The Hills Shire local government area (LGA), 25km north-west of the Sydney CBD and in proximity to the following centres in the region accessible along the North West Metro: Castle Hill, Norwest Business Park and Rouse Hill Town Centre.

The Site forms part of the broader Showground Station Precinct covering 271 hectares, rezoned in 2017 as part of the Department of Planning, Industry and Environment's priority precinct program. The rezoning of the Precinct, along with changes to height, density, and lot size controls, as well as other supporting controls will:

- transform the area around the new Hills Showground Station into a vibrant urban centre
- provide for a maximum of 5,000 new dwellings and 2,300 new jobs over 20 years
- deliver nearly two hectares of parks and new open space
- provide community facilities, recreation areas and a mix of housing choice for people at all life stages.

This rezoning of the broader precinct followed the finalisation of the North Rail Link Corridor Strategy in September 2013 by the Department and Transport for NSW (TfNSW) to guide planning and development along the rail corridor, with a Structure Plan prepared for each of the new eight stations. Subsequently, the Hills Shire Council (Council) unanimously voted to nominate the Showground Station Precinct, along with the Bella Vista Station and Kellyville Station Precincts, as Priority Precincts. These precincts were subsequently announced by the NSW Government in August 2014 as a means of implementing the Corridor Strategy and the Council's own corridor strategy known as 'The Hills Corridor Strategy adopted in November 2015'.

The planning controls for the Site and the broader Showground Station Precinct are set out in The Hills Local Environmental Plan 2012 (THLEP) and supported by site specific controls in The Hills Development Control Plan 2012 (THDCP).

The Site is envisaged to be developed to accommodate a high-density mixed-use precinct in line with the planning controls:

- Hills Showground Precinct West (Lot 53 DP 1253217) is zoned B2 Local Centre with maximum height of 68m (20 storeys) and Floor Space Ratio (FSR) of 5:1)
- Doran Drive Precinct (Lot 55 DP 1253217) is zoned B2 Local Centre with maximum height of 68m (21 storeys) and FSR of 4:1
- Hills Showground Precinct East (Lot 56 DP 1253217) is zoned R1 General Residential with a maximum building height of 52m (16 storeys) and FSR of 3:1.
- An excerpt of the zoning of the Site and broader Showground Precinct is provided at Figure 1.2.

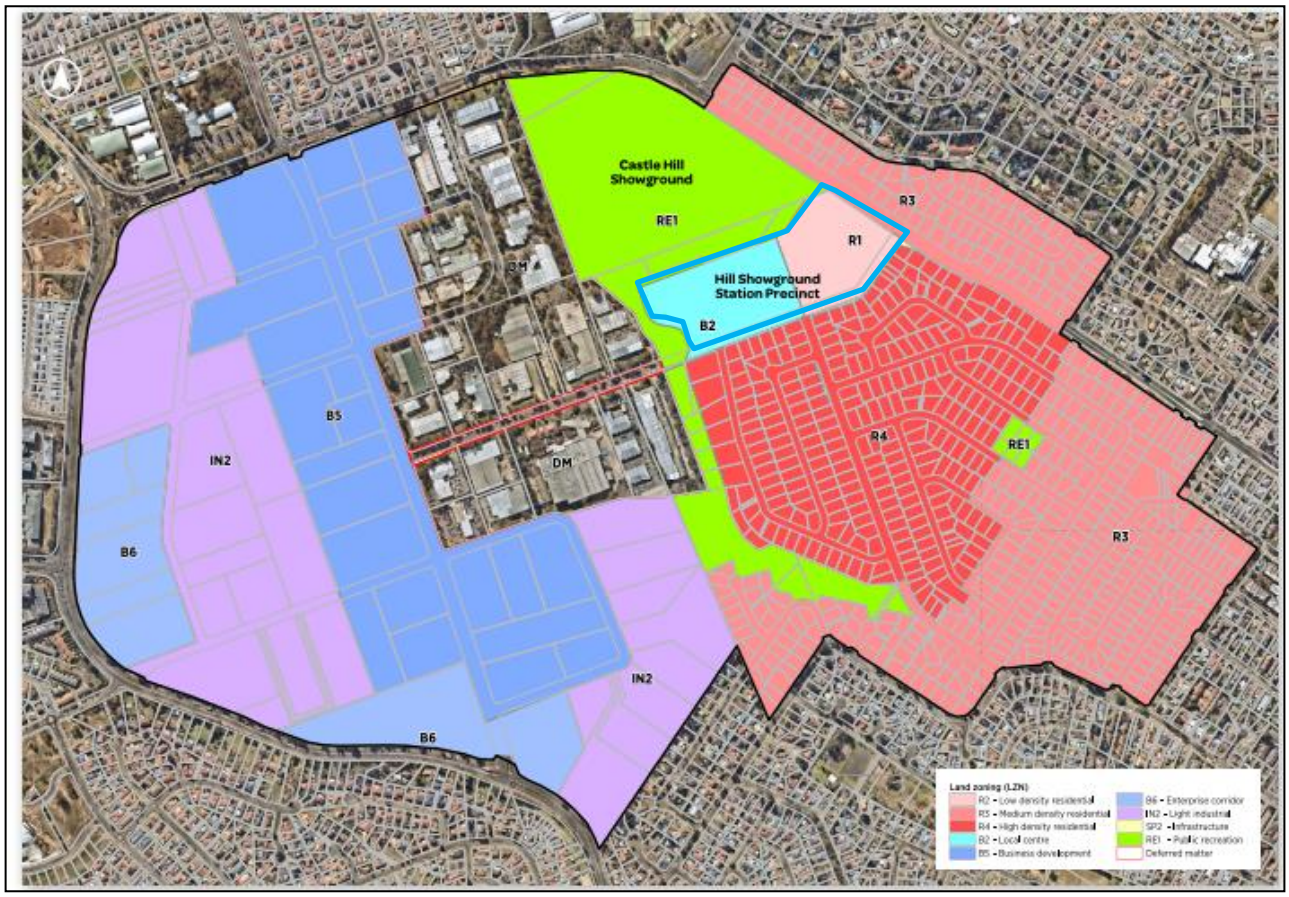



Figure 1.2 Zoning of the broader Showground Station Precinct

*Source: Department of Planning, Industry and Environment 2019*

### *1.3.1 HILLS COUNCIL DRAFT BUSHFIRE RISK MANAGEMENT PLAN 2019*

In May 2019, the Hills Bush Fire Management Committee (BFMC) prepared its draft Bush Fire Risk Management Plan (BFRMP). The draft BFRMP covers the whole of the Hills Shire area. It includes information about the local area and specifies works to be done to manage bush fire risk in the area. The draft BFRMP applies to all land in the Hills area including private land.

The site and the development lot- precinct east are not mapped as any of the categories requiring specific actions for fire management (eg Asset Protection Zone, Strategic Fire Advantage Zone, Fire Exclusion Zone) and so is considered as a Land Management Zone (LMZ) under the definition of the draft BFRMP. The purpose of the Land Management Zone as outlined in the draft BFRMP is to 'meet relevant land management objectives in areas where APZs or SFAZs are not appropriate'.

The site and the development lot- precinct east are not mapped as an 'asset' and therefore do not require specific treatments. Furthermore, the site and development lot- precinct east are not mapped as Bushfire Prone Land and therefore a bushfire assessment is not required.

## 1.4 REVISED CONCEPT PROPOSAL

The DA will specifically seek approval for a Revised Concept Proposal comprising:

- Building envelopes ranging in height between 12 metres (three storeys) and 68 metres (twenty-one storeys)
- A total gross floor area (GFA) of 166,486m2 across three development lots (known as Hills Showground Precinct West, Doran Drive Precinct and Hills Showground Precinct East)
- A maximum flexible use/residential GFA of 152,546m² allowing for up to 1,620 dwellings including a minimum of five percent for Affordable Housing
- A maximum commercial GFA of 13,940m²
- Doran Drive Plaza a minimum of 1,400m²
- A new public park of a minimum 3,500m² referred to as Precinct East Park
- Strategies for utilities and services provision, managing stormwater and drainage, achievement of ecologically sustainable development (ESD) and design excellence
- Civil plan addressing the timing of future subdivision, construction, release and development of land
- Concept principal subdivision of development Lot 56 DP 1253217 (Hills Showground Precinct East) and Part Lot 50 DP 1253217 into future major lots, public domain areas and roads.

Refer Figure 1.3 for excerpt of the Revised Concept Proposal Reference Scheme and Figure 1.4 for an excerpt of the Height Plan.

No building or construction works are proposed to be undertaken as part of this Revised Concept Proposal. Once the SSDA is approved, the successful purchasers of the development precincts and/or lots from Sydney Metro, will be responsible for submitting subsequent DAs for the design and construction of the buildings and public domain areas in accordance with the approved Revised Concept Proposal.

Figure 1.3 Revised Concept Proposal Reference Scheme

*Source: Cox Architecture 2020*

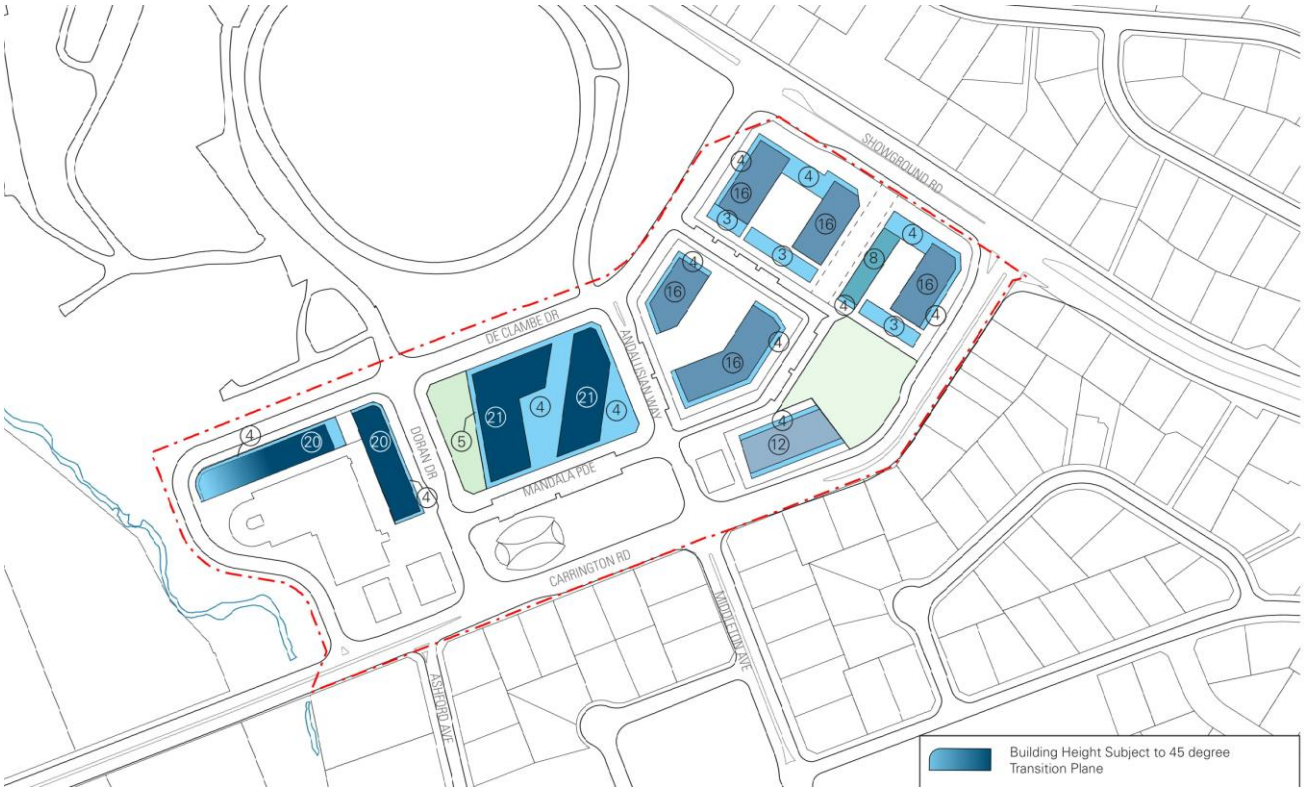



Figure 1.4 Height plan

*Source: Cox Architecture 2020*

## 1.5 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARS)

Draft SEARs were issued for the Sydney Metro Northwest– Hills Showground Station Precinct – concept proposal (SSD 9653) on the 26th October 2018. An Environmental Impact Statement (EIS) must be prepared in accordance with the *Environment Planning and Assessment Act 1979* (EP&A Act) and *Environmental Planning and Assessment Regulation 2000*. The SEARs require that an assessment of the concept proposal's biodiversity impacts in accordance with the BC Act, including the preparation of a BDAR. This BDAR has been prepared to adhere to the SEARs and will form part of the EIS for the concept proposal. Amended SEAR's were issued on 9th October 2019 and these have been incorporated in this BDAR.

Agency comments were received after submission of the Draft SEARs to DPIE, these include Hills Shire Council and Office of Environment and Heritage (now part of DPIE). Table 1.3 outlines the comments and where they are addressed within this BDAR.

Table 1.3 Agency Comments to Draft and Amended SEARs

| AGENCY | COMMENT | SECTION OF BDAR ADDRESSED |
|---|---|---|
| Hills Shire Council | The EIS should provide an assessment of the proposal's biodiversity impacts in accordance with the BC 2016, including the preparation of a Biodiversity Development Assessment Report (BOAR) (Now referred to as the BDAR) where required under the Act. | This report |
| | The riparian area is mapped on the Office of Environment and Heritage (now part of DPIE) Biodiversity Values (BV) Map. This area forms part of the vegetated riparian zone that provides a corridor along Cattai Creek. Under the principles set out by the Biodiversity Assessment Method Order (Biodiversity Assessment Method, 2017) and the BC Act, development should be designed to avoid impacts within this high biodiversity value land. The function of the local wildlife corridor cannot be offset at an external location and should therefore be retained. | No development within Cattai Creek will occur. However, some indirect impacts may occur as a result of the proposal.<br>The indirect impacts have been addressed in Sections 9.1 and 9.2. |
| | At least two threatened species (Powerful Owl and Eastern Bentwing Bat) are known from this area and both are likely to use the vegetated riparian corridor for foraging and dispersal throughout the landscape. A more comprehensive assessment of biodiversity is required throughout the EIS. | Section 6.5 |
| | The request for SEARs has not considered the potential of indirect impacts to biodiversity. The ecological assessment must consider both direct and indirect impacts to the riparian corridor and downstream habitats. Best practice stormwater management should be imposed to protect important downstream foraging habitats for known threatened species. | Section 9.3<br>Mitigation measures in Section 10 |

| AGENCY | COMMENT | SECTION OF BDAR ADDRESSED |
|---|---|---|
| | The request for SEARs notes that the riparian land adjoining Cattai Creek that forms part of the subject site will be dedicated to Council in its current form. Please note that this land will to either be embellished prior to dedication or alternatively funding should be provided for future embellishment of the land. This could occur by way of a Planning Agreement between Landcom and Council. If the land is not embellished and no funding is provided for the embellishment then Council would be burdened with the cost of embellishment, which would not be an acceptable outcome. | Section 9.1.2<br>Assessment of Impacts |
| Department of Planning, Industry and Environment (DIPE) (Office of Environment and Heritage, now part of DPIE) | Biodiversity impacts related to the proposed development are to be assessed in accordance with Section 7.9 of the BC Act the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the BC Act 2016 (s6.12), *Biodiversity Conservation Regulation 2017* (s6.8) and Biodiversity Assessment Method, including an assessment of the impacts of the proposal (including an assessment of impacts prescribed by the regulations). | This report |
| | The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method. | Sections 9.1, 9.2 and 9.3 |
| | The BDAR must include details of the measures proposed to address the offset obligation as follows;<br>• The total number and classes of biodiversity credits required to be retired for the development project;<br>• The number and classes of like-for-like biodiversity credits proposed to be retired;<br>• The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules;<br>• Any proposal to fund a biodiversity conservation action;<br>• Any proposal to conduct ecological rehabilitation (if a mining project);<br>• Any proposal to make a payment to the Biodiversity Conservation Fund.<br>If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits. | The project has not triggered the biodiversity offset scheme and no biodiversity offsets are required.<br>Section 11 |
| | The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM. | GIS data will be submitted with this BDAR. |

| AGENCY | COMMENT | SECTION OF BDAR ADDRESSED |
|---|---|---|
| | The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the *Biodiversity Conservation Act 2016.* | Report prepared by<br>Accredited BAM assessor<br>Deborah Landenberger<br>BAAS 18187<br>Reviewed by accredited BAM assessor<br>Alex Cockerill BAAS17020 |


| | |
|---|---|
| Map: PS116837_GIS_001_A4 | Author: David.Naiken |
| Date: 15/10/2019 | Approved by: D.Landenberger |

*Data Source: Imagery - Nearmap, 2019*

0 100 200 m

1:8,000

*Coordinate system: GDA 1994 MGA Zone 56*

Scale ratio correct when printed at A3



**Hills Showground Biodiversity Development Assessment Report**

**Figure 1-5**

Location Map

# 2 LEGISLATIVE CONTEXT

## 2.1 BIODIVERSITY CONSERVATION ACT 2016

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

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

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

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

## 2.2 FISHERIES MANAGEMENT ACT 1994

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

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

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

The concept proposal will not impact on any watercourse or potential fish habitat such that it would result in dredging or reclamation, imped fish passage, damage marine vegetation or de-snagging. The concept proposal has the potential to have indirect impacts upon Cattai Creek, such as water quality, sedimentation and increase in weed invasions. However, these impacts are expected to be minor and mitigations measures will be implemented to reduce the potential impacts.

## 2.3 BIOSECURITY ACT 2015

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

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

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

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

## 2.4 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

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

The EPBC Act has been considered in this assessment through:

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

# 3 METHODOLOGY

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

## 3.1 PERSONNEL

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

Table 3.1 Personnel

| NAME | QUALIFICATIONS | ROLE |
|---|---|---|
| Alex Cockerill | Bachelor of Science (Hons)<br>Accredited BAM Assessor (BAAS17020) | Principal Ecologist - Technical Review |
| Josie Stokes | Bachelor of Science (Conservation Zoology) | Principal Ecologist – Reporting and Project Management |
| Debbie Landenberger | Bachelor of Science (Hons);<br>Accredited BAM Assessor (BAAS 18187) | Principal Ecologist – Reporting and Field surveys |
| Gavin Shelley | Bachelor of Environment Science and Management | Graduate Ecologist – Reporting and Field Surveys |
| David Naiken | Bachelor of Environmental Science with Major in GIS<br>Master of Climate Change | GIS Consultant – Mapping and data management |

## 3.2 NOMENCLATURE

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

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

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

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

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

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

## 3.3 BACKGROUND RESEARCH

Background research was conducted to identify:

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

The background research included analysis of the following information sources:

- Aerial photographic imagery (Land and Property Information, 2018a)
- NSW Mitchell Landscapes (Land and Property Information, 2018b)
- Interim Biogeographic Regionalisation of Australia (IBRA version 7.0) (Department of Environment & Energy 2016)
- Atlas of Groundwater Dependent Ecosystems (GDE) (Australian Bureau of Meteorology 2019)
- Directory of Important Wetlands of Australia (Department of Environment & Energy 2019b)
- State Environmental Planning Policy (Coastal Management) 2018 – Coastal Wetlands (NSW Department of Planning & Environment, 2018)
- Priority weed listings for the Greater Sydney region (Department of Primary Industries 2019)
- The Native Vegetation of the Sydney Metropolitan Area (Office of Environment and Heritage 2016b).
- Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands (Tozer *et al.* 2010)
- Ecological Constraints Assessment for Showground Station Priority Precinct Plan (EcoLogical Australia, 2015)
- Threatened species database searches outlined in Table 3.2.

Table 3.2 Threatened species database searches

| DATABASE | SEARCH DATE | AREA SEARCHES | REFERENCE |
|---|---|---|---|
| PlantNET spatial search | 15 September 2019 | 5 km radius centred on the suburb of Castle Hill | Royal Botanic Gardens and Domain Trust (2019) |
| BioNet Atlas species sighting search | 15 September 2019 | 10 km x 10 km centred on the Site | DPIE (2019a) |
| EPBC Protected Matters Search Tool | 15 September 2019 | 10 km x 10 km centred on the Site | Department of Environment & Energy (2019a) |

| DATABASE | SEARCH DATE | AREA SEARCHES | REFERENCE |
|---|---|---|---|
| NSW Department of Primary Industries (Fishing and Aquaculture) spatial data | 15 September 2019 | The Hills Council LGA | Department of Primary Industries (2019a) |

## 3.4 NATIVE VEGETATION AND THREATENED FLORA SURVEYS

Native vegetation and threatened flora surveys were undertaken on the 23 September 2019. Surveys focused on the mapping of any native and non-native vegetation types and targeting the possible presence of threatened flora species using a combination of vegetation integrity plots random meanders and parallel field traverses generally in accordance with the NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation 2004), NSW Guide to Surveying Threatened Plants (Office of Environment & Heritage 2016a) and the BAM (Office of Environment & Heritage 2017). A detailed overview of terrestrial flora survey methods is presented below.

### *3.4.1 STRATIFICATION AND VERIFICATION OF EXISTING VEGETATION MAPPING*

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation.

Vegetation within the Site and locality has been mapped at the regional scale in:

- Native vegetation of the Southeast NSW: Revised Classification and Map for the Coast and Eastern Tablelands (Tozer *et al*. 2010).
- The Native Vegetation of the Sydney Metropolitan Area (Office of Environment and Heritage 2016b).

Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, dams and power lines), vegetation structure and likely native versus exotic species composition throughout the Site. This provided an initial definition of vegetation communities into simple structural and disturbance classifications for verification during field surveys.

Data on geology, dominant canopy species, native species richness, vegetation structure and condition was collected across the Site during field surveys to validate and refine this existing vegetation classification to determine their associated PCT in accordance with the BioNet Vegetation Classification System (Office of Environment & Heritage, 2019a).

No remnant native vegetation has been mapped within the Site. Historic literature and field validation was undertaken to verify the broad scale mapping.

### *3.4.2 MAPPING OF VEGETATION ZONES*

The vegetation within the site was firstly assessed to determine if it met PCT level and then if it was to be aligned to a vegetation zone which is defined in the BAM as ‘an area of native vegetation on the site that is the same PCT and has a similar broad condition state’ (Office of Environment & Heritage, 2019a). No patches of any remnant native vegetation were observed within the site and therefore no PCT or vegetation zones were assigned as part of the BDAR.

### 3.4.3 VEGETATION INTEGRITY PLOTS

No remnant native vegetation remains within the Site and as such vegetation integrity plots were not completed as part of this BDAR.

### 3.4.4 RANDOM MEANDER SURVEY

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

Random meander surveys were conducted to locate candidate threatened species and populations within area of suitable habitat.

### 3.4.5 PARALLEL FIELD TRAVERSES

Parallel field traverses followed methods outlined in the NSW Guide to Surveying Threatened Plants (Office of Environment & Heritage 2016b). Parallel field traverses involved two people walking a fixed bearing transect at 10 metre intervals over known or high likelihood potential habitat for candidate threatened flora species.

### 3.4.6 THREATENED FLORA LIKELIHOOD OF OCCURRENCE ASSESSMENT

Threatened flora species and populations subject to likelihood of occurrence assessments were those identified during the background research, BAM calculator candidate and predicted species list and any additional species considered to have the potential to occur in the professional opinion of contributors to this assessment.

The likelihood of occurrence assessment was utilised to produce a candidate species list to inform appropriate targeted surveys. The assessment was based on the habitat profile for the species and other habitat information in the Threatened Species Profile Database (DPIE 2019c) and the Species Profile and Threats Database (Department of the Environment and Energy 2019c).

The assessment also included consideration of the dates and locations of nearby records and information about species distribution and populations in the locality along with key habitat requirements such as:

- Associated native plant community types and taxa
- Topographic, soil or geological preferences
- Microhabitats (e.g. preference for rocky outcrops, ground soaks or tree canopies)
- Disturbances, such as fire history, and the level and type of disturbance (e.g. slashing, canopy removal).

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

Table 3.3 Likelihood of occurrence criteria for terrestrial threatened flora species and populations

| LIKELIHOOD | CRITERIA |
|---|---|
| Known | The species was observed in the Site either during the current survey or during another survey less than 5 years prior; assuming no significant change in conditions on Site (e.g. vegetation clearing, fire). |
| High | A species has a high likelihood of occurrence if:<br>— The Site contains or forms part of a large area (> 1 ha) of high quality suitable habitat that has not been subject to recent disturbance (e.g. fire), the species is known to form a persistent soil seedbank and the species has been recorded recently (within 10 years) in the locality<br>— The species is a cryptic flowering species that has been recorded recently (within 10 years) in the locality and has a large area (> 1 ha) of high quality potential habitat on Site that was not seasonally targeted by surveys. |
| Moderate | A species has a moderate likelihood of occurrence if:<br>The species:<br>— Has a small area (< 1 ha) of high quality suitable habitat or a large area (> 1 ha) of marginal habitat in the Site that has not been subject to recent disturbance (e.g. fire), and<br>— The species is known to form a persistent soil seedbank, and<br>— The species has been recorded recently (within 10 years) in the locality.<br>The species is a cryptic flowering species, with a small area of high quality potential habitat (< 1 ha) or a large area of marginal habitat on Site (> 1 ha), that was not seasonally targeted by surveys. |
| Low | A species has a low likelihood of occurrence if:<br>— The species' potential habitat is of high quality but is small in area (< 1 ha) and it is not a cryptic species nor a species known to have a persistent soil seedbank or<br>— The species' potential habitat is marginal and the species has not been recorded in the locality. |
| None | Potentially suitable habitat is absent from the site. |

## 3.5 THREATENED FAUNA SURVEYS

This section outlines the fauna survey effort completed for candidate species which were predicted to have a moderate to high likelihood of occurrence within the Site based on database searches or those requiring further investigation as requested by Hills Shire Council in their response to the draft SEARs as outlined in Section 1.5. Threatened fauna surveys completed within the Site and within Cattai Creek were carried out as described below and where applicable, considering the methodology detailed in the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation 2004) and the *'Species credit' threatened bats: NSW survey guide for the BAM* (OEH 2018).

Fauna surveys were limited to fauna habitat assessments, opportunistic sightings, diurnal bird surveys, diurnal inspection of potential microbat roosting habitat (culverts) and nocturnal spotlighting and an active Anabat survey.

### 3.5.1 FAUNA HABITAT ASSESSMENT

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

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

The criteria were used to evaluate the condition of habitat values is outlined in Table 3.4.

Table 3.4 Fauna habitat assessment evaluation criteria

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

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

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

During these surveys, a hand-held GPS was used to record the locations significant fauna habitat values such as large hollow-bearing trees and aquatic habitat where observed.

### 3.5.3 DIURNAL BIRD SURVEYS

Two formal 20-minute diurnal bird searches were completed within the Site. Bird surveys were completed by actively walking through the Site over a period of 20 minutes. All birds were identified to the species level, either through direct observation or identification of calls. Bird surveys were completed generally during morning or evening hours. Birds were also recorded opportunistically throughout the field investigation.

Where seasonal conditions for some species were not suitable during the timing of survey, likelihood of occurrence assessments were conducted by the presence/absence of suitable habitat and its condition.

### 3.5.4 ANABAT SURVEYS

One ultrasonic Anabat detector (Anabat Express, Titley Scientific QLD) was deployed at the Cattai Creek culvert for one night to record echolocation calls of microchiropteran bats. Anabat detectors were set to record bat vocalisations starting at dusk. Bat activity is used as a substitute for abundance, and is based on the number of microchiropteran bat calls recorded during the survey period, including those calls assigned to a species complex (i.e. not positively attributable to an individual species).

### 3.5.5 THREATENED FAUNA LIKELIHOOD OF OCCURRENCE ASSESSMENT

Threatened species identified in the desktop review were assessed for likelihood of occurrence based on results of the desk and field-based assessments. The likelihood of threatened species occurring within the Site was assessed against the criteria outlined in Table 3.5.

Table 3.5 Likelihood of occurrence criteria for threatened fauna species

| LIKELIHOOD | CRITERIA |
|---|---|
| Known | The species was observed in the site either during the current survey or during another survey less than 5 years prior; assuming no significant change in conditions on Site (e.g. vegetation clearing, fire). |
| High | A species has a high likelihood of occurrence if:<br>— the site contains or forms part of a large area (home range of more than a single individual or pair) of high quality suitable habitat<br>— important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the site<br>— the species has been recorded recently in similar habitat in the locality<br>— the site is likely to support a resident population or to contain habitat that is visited by the species during regular seasonal movements or migration. |
| Moderate | A species has a moderate likelihood of occurrence if:<br>— the site contains or forms part of a small area (home range of more than a single individual or pair) of high quality suitable habitat<br>— the site contains or forms part of a large area of marginal habitat<br>— important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the site<br>— the site is unlikely to support a resident population or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal. |

| LIKELIHOOD | CRITERIA |
|---|---|
| Low | A species has a low likelihood of occurrence if:<br>— potentially suitable habitat exists but<br>— the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct)<br>— the habitat is marginal and small in area and isolated from other areas of suitable habitat.<br>and/or<br>— the species is considered to be a rare vagrant, likely only to visit the site very rarely; e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds). |
| None | Potentially suitable habitat is absent from the site. |

# 4 LANDSCAPE CONTEXT

## 4.1 LANDSCAPE FEATURES

The site is in the Sydney Basin IBRA bioregion and occurs within the SYB08 Cumberland IBRA subregion (IBRA version 7.0). Landscape features within the site as prescribed in Section 4 of the BAM are summarised in Table 4.1 and shown in Figure 4.1.

Table 4.1 Landscape feature associated with the Site

| LANDSCAPE FEATURE | THE SITE |
|---|---|
| IBRA bioregions and subregions | Sydney Basin Bioregion / SYB08 Cumberland subregion |
| NSW landscape regions (Mitchell landscapes) | Sydney – Blaxland Ridge in the western of the site<br>Sydney – Pennant Hills Ridges in the eastern portion of the site |
| Local Government Area (LGA) | The Hills Shire Council |
| Rivers and streams | No river or streams occur within the site. Cattai Creek occurs to the west of the site, which is a 2nd Order Stream. |
| Important and local wetlands | No important wetlands occur within the site. |
| Connectivity features | The site is surrounded by urban development, however Cattai Creek occurs 200m to the west of the site. Cattai Creek provides connectivity to a large area of native vegetation to the north of the site. |
| Areas of geological significance and soil hazard features | The site does not contain any areas of geological significance. Soil landscapes Hawkesbury Colluvial in Cattai Creek, Glenorie Wianamatta shale in the site. |
| Areas of outstanding biodiversity value | No declared areas of outstanding biodiversity value occur in or near the site. |

## 4.2 DETERMINING SITE CONTEXT

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

### *4.2.1 NATIVE VEGETATION COVER*

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

Table 4.2 Native vegetation cover

| ASSESSMENT AREA | TOTAL ASSESSMENT AREA (HA) | AREA OF NATIVE VEGETATION COVER (HA) | NATIVE VEGETATION PERCENTAGE COVER |
|---|---|---|---|
| 1500m buffer | 897.66 ha | 116.46 ha | 13% |

Source: Native vegetation of the Southeast NSW: Revised Classification and Map for the Coast and Eastern Tablelands (Tozer *et al.* 2010) and The Native Vegetation of the Sydney Metropolitan Area (Office of Environment and Heritage 2016b).

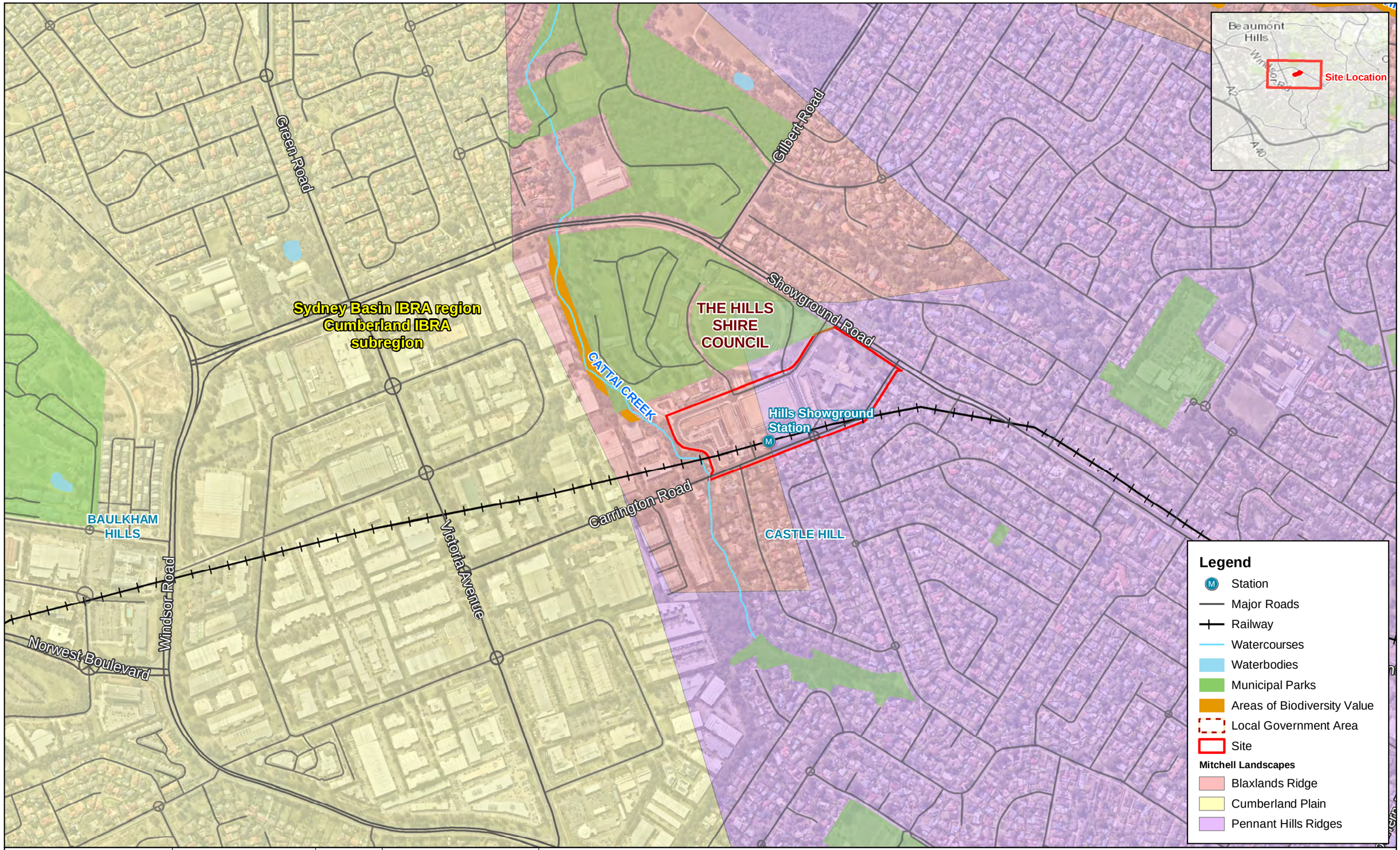
### 4.2.2 PATCH SIZE

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

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

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

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

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|---|---|---|---|
| Map: PS116837_GIS_002_A4 | Author: David.Naiken | | 0 100 200 m<br>1:8,000 |
| Date: 15/10/2019 | Approved by: D.Landenberger | | *Coordinate system: GDA 1994 MGA Zone 56* |
| *Data Source: Imagery - Nearmap, 2019* | | | Scale ratio correct when printed at A3 |



**Hills Showground Biodiversity Development Assessment Report**

**Figure 4-1**
Landscape Features


| | | | |
|---|---|---|---|
| Map: PS116837_GIS_003_A4 | Author: David.Naiken | | |
| Date: 15/10/2019 | Approved by: D.Landenberger | | |
| *Data Source: Imagery - Nearmap, 2019* | | | |

0 100 200 m
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*Coordinate system: GDA 1994 MGA Zone 56*

Scale ratio correct when printed at A3



**Hills Showground Biodiversity Development Assessment Report**

**Figure 4-2**
Native Vegetation Cover

# 5 VEGETATION TYPES AND THREATENED ECOLOGICAL COMMUNITIES

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

## 5.1 OVERVIEW

No remnant native vegetation or associated PCTs were recorded in the site or development lot - precinct east.

One non-native vegetation type was recorded, being:

- Miscellaneous ecosystem – urban exotic / native landscape plantings.

The extent and distribution of this vegetation type is shown in (Figure 5.1) and a summary and description the non-native vegetation type is presented in Section 5.3.

## 5.2 NATIVE VEGETATION

No remnant native vegetation or associated PCTs were recorded in the site or development lot - precinct east. The development lot - precinct east in the north east of the site consists of a council building with surrounding native and non-native plantings. There is a car park surrounding the building, with cement pads along Showground Road where buildings have previously been demolished. The eastern section of the site contains the Hills Showground Metro railway station and a multi-level car park.

## 5.3 NON-NATIVE VEGETATION

### *5.3.1 MISCELLANEOUS ECOSYSTEM – URBAN EXOTIC / NATIVE LANDSCAPE PLANTINGS*

This non-native vegetation type consists of landscape plantings and managed lawn areas within the development lot - precinct east. This vegetation type is the only vegetation type that was recorded within the site and encompasses approximately 0.87 hectares. The distribution of this vegetation type is shown in Figure 5.1 with photographic representation provided in Photo 5.1 to Photo 5.4.

The dominant planted canopy species include; *Corymbia maculata* (Spotted gum), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus scoparia* (Wallangarra White Gum), *Casuarina cunninghamiana* (River Oak), *Casuarina glauca* (Swamp Oak), *Phoenix cannariensis* (Canary Island Date Palm), *Achontophoenix alexandrae** (Alexander Palm) and *Butia capitata** *(*Jelly Palm).

Exotic grassland species include: *Cenchrus clandestinus** (Kikuyu Grass), *Trifolium repens** (White Clover), *Modiola caroliniana** (Red Malva), *Cotula australis* (Carrot Weed), *Brassica fruitosa, Ehrhartia erecta** (Panic Veldtgrass), *Facelis retusa** (Annual Trampweed), *Lysimachia arvensis** (Scarlet Pimpernel) along with a larger range of annual and perennial exotic grass and forb species.

## 5.4 PRIORITY WEEDS

During field surveys, 74 species of plant were recorded. Of these 19 were native and 55 were introduced species (refer to Appendix C).

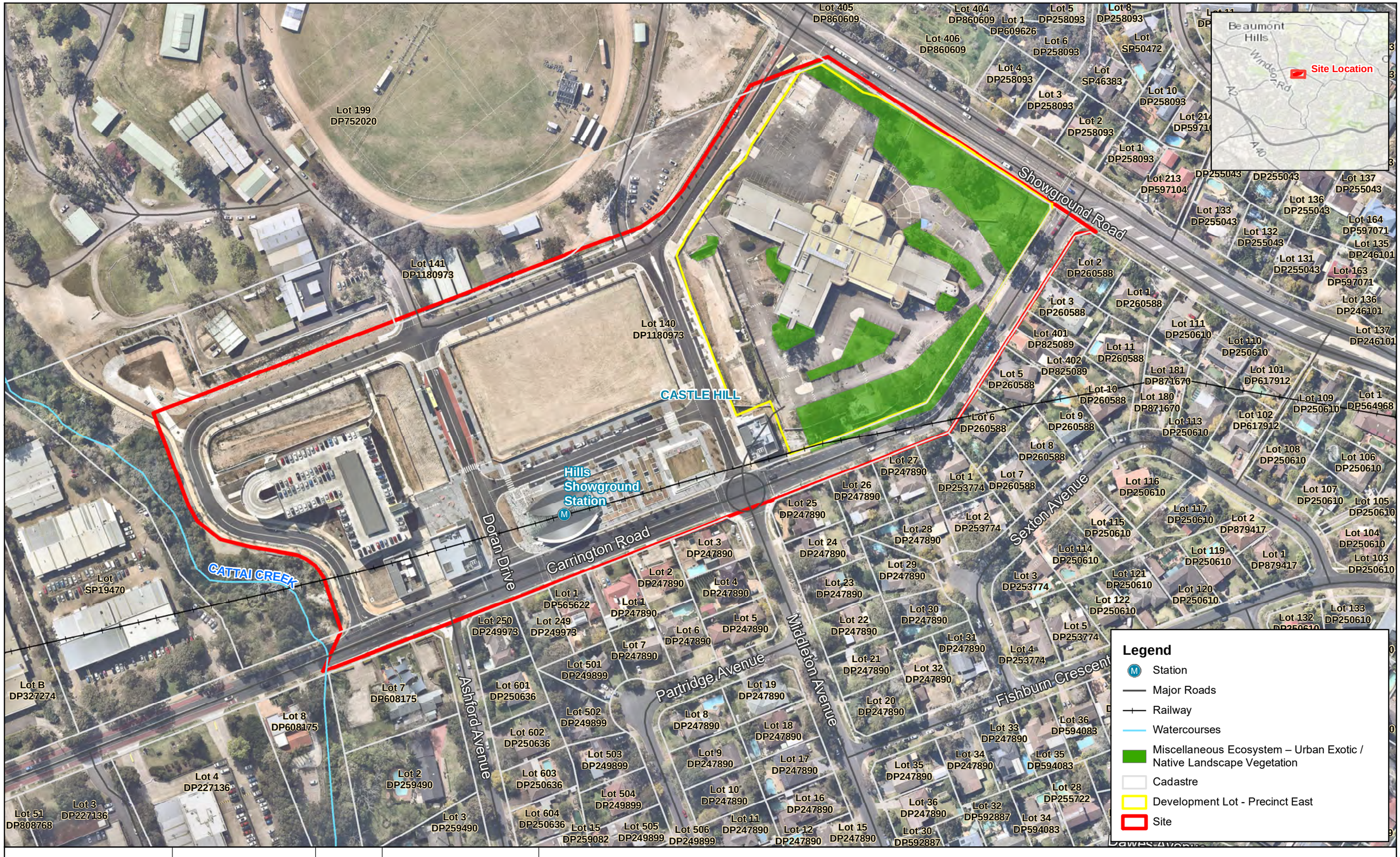
None of the introduced plant species recorded are listed under the NSW *Biosecurity Act 2015* as priority weeds for the Greater Sydney region (Department of Primary Industries, 2019a). None of the introduced plant species were listed as Weeds of National Significance (Australian Weeds Committee, 2019).

Photo 5.1 Planted *Phoenix cannariensis* (Canary Island Date Palm)

Photo 5.2 Planted *Corymbia maculata* (Spotted Gums)

Photo 5.3 Planted gardens on the southern side of the disused Hills Shire Council administration building

Photo 5.4 Planted Street Trees along Showground Road

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| Date: 15/10/2019 | Approved by: D.Landenberger | | *Coordinate system: GDA 1994 MGA Zone 56*<br>Scale ratio correct when printed at A3 |

*Data Source: Imagery - Nearmap, 2019*



**Hills Showground Biodiversity Development Assessment Report**

**Figure 5-1**
Vegetation Types

# 6 THREATENED BIODIVERSITY

## 6.1 THREATENED ECOLOGICAL COMMUNITIES

No remnant native vegetation or associated PCTs were recorded in the site or development lot- precinct east. No areas of native landscape plantings are considered to meet any threatened ecological community listing under the BC Act.

## 6.2 FLORA HABITATS

As stated within section 5.2, as the development lot - precinct east has been previously modified for the construction of a council administration building and all patches of native vegetation occur because of landscape plantings. Given this, the occurrence of native remnant flora and regeneration ability is considered unlikely.

## 6.3 THREATENED FLORA SPECIES

No remnant native vegetation or associated PCTs were recorded in the site or development lot - precinct east. Due to the absence of any PCT, the BAM calculator was not possible to run and as such no candidate species list was generated.

Non-native vegetation is a prescribed matter under Reg 6.1 of the Biodiversity Conservation Regulation 2017 and section 6.7 of the BAM requires the consideration of impacts on any biodiversity values. The non-native vegetation types recorded within the site are considered to provide limited to no potential habitat for threatened flora species.

As the site is currently part of the urban environment with no remnant native vegetation the overall likelihood of occurrence for the 36 threatened flora species that are known or predicted to occur within the locality have been assessed as low (Appendix A). Notwithstanding this, *Eucalyptus scoparia* (Wallangarra White Gum) which is listed as endangered under the BC Act and Vulnerable under the EPBC Act was recorded within the site. *Eucalyptus scoparia* (Wallangarra White Gum) is commonly planted as a landscape and a street tree throughout NSW and the site is outside the natural geographic range of this species.

## 6.4 FAUNA HABITATS

Those fauna habitats identified within the site include disturbed land with limited native vegetation (planted) and exotic grassland. Riparian vegetation is limited to an area adjacent to the site.

No remnant native vegetation is present on the site and the limited native vegetation (planted) is dominated by *Corymbia maculata* (Spotted gum), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus scoparia* (Wallangarra White Gum), *Casuarina cunninghamiana* (River Oak), *Casuarina glauca* (Swamp Oak), *Phoenix cannariensis* (Canary Island Date Palm), *Achontophoenix alexandrae** (Alexander Palm) and *Butia capitata** (Jelly Palm).

The exotic grassland vegetation is dominated by *Cenchrus clandestinus** (Kikuyu Grass), *Trifolium repens** (White Clover) and *Modiola caroliniana** (Red Malva). No fallen timber or rocky habitat was identified in these areas. These areas are likely to provide foraging habitat for common species typical of disturbed environments or parklands (i.e. Australian Magpie, Magpie-lark and Masked Lapwing).

The riparian area adjacent to the site provides some aquatic habitat for some fauna species. However, due to the disturbed nature it only provides marginal habitat and is likely only to be utilised by locally common species of birds, possums (Brushtail and Ringtail) and frogs (i.e. Striped Marsh Frog).

Due to the small amount of potential resources available it is unlikely that the native plantings within the site are highly relied upon by locally occurring fauna (eg nectivorous birds). No hollow-bearing trees were identified within site.

Overall the fauna habitat is in a poor condition due to the site being within an urban area and already subject to clearing from previous construction.

## 6.5 THREATENED FAUNA SPECIES

Background investigations identified 31 threatened fauna species (BC Act) as having been previously recorded or are predicted to occur within the locality (Appendix B). The likelihood of these species occurring within the site was determined based on field investigations and fauna habitat available. No threatened fauna species have been identified to have a high likelihood to occur. No threatened fauna species were identified utilising the site during field surveys, although the Grey-headed Flying-fox (*Pteropus poliocephalus*) listed as vulnerable under the BC Act was observed flying over the adjacent riparian zone.

### *6.5.1 LARGE FOREST OWLS AND MICROBATS*

There is a low likelihood of threatened fauna species occurring on the site. As noted in Section 6.2 above, the BAM credit calculator was unable to be run due to the lack of remnant native vegetation and associated PCTs.

The Hills Shire Council provided comment on the draft SEARs which included assessing potential impacts on the Powerful Owl and Large Bent-wing Bat (*Miniopterus orianae oceanensis*). Consequently, large forest owls, including the Powerful Owl (*Ninox strenua*) and Masked Owl (*Tyto novaehollandiae*) were considered based on database records in the broader locality (BioNet 2019), the presence of suitable prey species i.e. Ringtail possums, and breeding habitat in the form of a large hollow bearing tree in the adjacent riparian zone. (Photo 6.1).

Photo 6.1 Large hollow-bearing tree on adjacent land to the south-west of De Clambe Drive.

Targeted surveys for large forest owls were conducted within the site and the adjoining riparian areas on 23 September 2019. The large hollow-bearing tree shown in Photo 6-1 was stag watched and failed to identify any evidence of Large forest owls within the site or adjacent riparian vegetation.

Surveys for the Large Bent-winged Bat were also undertaken within the site and the adjoining riparian area.

Given the result of targeted surveys and the lack of any recent records of the species in the broader locality, large forest owls are considered unlikely to be affected by the concept proposal. The Large Bent-winged Bat was not recorded during active searches of potential roosting habitat (e.g. concrete box cell culvert) nor recorded during Anabat surveys. The removal of approximately 0.87 hectares of planted vegetation is not likely to affect the Large Bent-winged Bat. The riparian area that may provide potential foraging habitat for the Large Bent-winged Bat is unlikely to be affected by the concept proposal provided mitigation measures outlined in the Integrated Water Cycle Management Strategy are implemented.

## 6.6 THREATENED AQUATIC SPECIES

The site does not contain any mapped watercourses or permanent water bodies that would provide habitat for any listed threatened aquatic species under the FM Act.


| | |
|---|---|
| Map: PS116837_GIS_005_A4 | Author: David.Naiken |
| Date: 15/10/2019 | Approved by: D.Landenberger |

*Data Source: Imagery - Nearmap, 2019*

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*Coordinate system: GDA 1994 MGA Zone 56*

Scale ratio correct when printed at A3



**Hills Showground Biodiversity Development Assessment Report**

**Figure 6-1**
Threatened Species and Hollow-Bearing Trees

# 7 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

No patches of remnant native vegetation were recorded within the site. The recorded non-native vegetation type does not contain floristic, structural and locational characteristics that would meet key diagnostic characteristics or condition thresholds for any listed threatened ecological community under the EPBC Act.

## 7.1 THREATENED ECOLOGICAL COMMUNITIES

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

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

No threatened ecological communities occur within the Site.

## 7.2 THREATENED SPECIES

### *7.2.1 THREATENED FLORA SPECIES*

The protected matters search conducted for this concept proposal identified 26 predicted threatened flora species as potentially occurring within the locality. The results of the field surveys and likelihood of occurrence assessments have determined these species to have a low likelihood of occurrence and are not considered to be affected by the concept proposal (Appendix A).

### *7.2.2 THREATENED FAUNA SPECIES*

The protected matters search conducted for this concept proposal identified 78 EPBC listed threatened fauna species that have been previously recorded or have the potential to occur within the locality (Appendix B). The likelihood of these species occurring within the site was determined based on field investigations and fauna habitat available. No EPBC listed threatened fauna species have been identified to have a moderate – high likelihood of occurring within the site. No threatened fauna was identified utilising the site during field survey. Whilst the Grey-headed Flying-fox (*Pteropus poliocephalus*) is considered to have a low likelihood of habitat utilisation within the site, two individuals were observed flying over the adjacent riparian zone. The site does contain a small number of Eucalypt trees that may provide

occasional foraging opportunities for this species. Removal of these trees is unlikely to significantly impact the Grey-headed Flying-fox.

## 7.3 MIGRATORY SPECIES

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

Based on field investigations, EPBC Protected Matters area search and other desktop database searches, 35 (excluding migratory marine species) migratory fauna species were identified that could occur within the locality. Based on field investigations and habitat assessments none of these have a moderate – high likelihood to utilise the site, due to the site's isolated and disturbed nature.

The habitats within the site are unlikely to constitute important habitat for any of the identified species. The habitat present is unlikely to support significant proportions of the population of any migratory species nor are the habitats critical to any life stage of these species. Due to their mobile nature, the identified species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur. Because of this, the identified species are not considered to be impacted by the concept proposal and are not considered further in this report.

## 7.4 WORLD & NATIONAL HERITAGE PROPERTIES

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

## 7.5 WETLANDS OF INTERNATIONAL IMPORTANCE

No wetlands of international importance were identified within the locality of the site.

# 8 AVOID AND MINIMISING IMPACTS ON BIODIVERSITY VALUES

## 8.1 MEASURES TO AVOID IMPACTS

Given the site contains no patches of remnant vegetation and small patches planted native and non-native plant species the site has limited biodiversity values, the positioning of the development lot - precinct east was not considered to warrant any specific avoidance measures.

## 8.2 RECOMMENDED MEASURES TO MINIMISE IMPACTS

Future detailed DA's will be lodged for construction of buildings, open space, subdivision and associated works. A Construction Management Plan (CMP) would be required under the conditions for consent for concept proposal for each of these DA's. The CMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the procedures outlined below. The proposed mitigation measures would include environmental safeguards for protection of neighbouring properties and waterways in accordance with relevant policy documentation and Government guidelines.

Recommended mitigation measures are detailed in section 10.

# 9 ASSESSMENT OF IMPACTS

## 9.1 ASSESSMENT OF IMPACTS ON NATIVE VEGETATION AND THREATENED SPECIES HABITAT

### *9.1.1 NATIVE VEGETATION*

The vegetation within the development lot - precinct east consists of one non-native vegetation type which does not align with any PCT as outlined under section 9.1 of the BAM. The concept proposal will result in the removal of one non-native vegetation type (Miscellaneous ecosystem) which consists of native and non-native plantings. It has been assumed as part of this assessment that all this vegetation will be removed, however this removal maybe reduced depending upon the impacts from the future DA's to be lodged for the site. The extent of this vegetation type within the site and the development lot - precinct east is outlined in Table 9.1.

Table 9.1 Development lot - precinct east impacts on non-native vegetation types

| NON-NATIVE VEGETATION TYPE | SITE | DEVELOPMENT LOT - PRECINCT EAST |
|---|---|---|
| Miscellaneous ecosystem – urban exotic / native landscape plantings | 0.87 ha | 0.87 ha |
| **Total** | **0.87 ha** | **0.87 ha** |

Based on targeted field surveys and habitat assessments, the non-native vegetation type recorded within the site has been assessed as providing limited to no habitat for any threatened species listed under the BC Act. Approximately 116.4 ha of intact native vegetation has been mapped within 1500ha buffer of the concept proposal area by regional mapping concept proposals of the Native vegetation of the Southeast NSW (Tozer *et al.* 2010) and the Native Vegetation of the Sydney Metropolitan area (Office of Environment and Heritage, 2016b). Therefore, the removal of a small area (0.87ha) of native plantings and urban exotic vegetation is minor in regard to the larger area of native vegetation extent within the region.

### *9.1.2 TRANSPORT OF WEEDS INTO CATTAI CREEK*

The clearing of the non-native vegetation type due to earthworks would increase the potential to transport weeds from the site into Cattai Creek. Cattai Creek is highly degraded with a high diversity and density of priority and weeds of national significance (WONS). These weeds include, Lantana, Large Leaf Privet, Small Leaved Privet and Moth Vine. The weeds within the site are restricted to pasture weeds, with no priority weeds or weeds of national significance occurring within the site.

The potential introduction or spread of weed species into Cattai Creek is considered to be minor during routine maintenance (mowing/slashing). Even so, management measures would be required to minimise the risk of introduction and spread of weeds.

This indirect impact corresponds to one Key Threatening Process listed under BC Act:

- Invasion of native plant communities by exotic perennial grasses

The ownership of the drainage reserve has been transferred to Hills Shire Council. A masterplan for the Showground Station Precinct (Hills Shire Council, 2018) is currently being developed by Hills Shire Council. As part of the proposed Master Plan riparian corridor improvements are proposed these include bank stabilisation, restoration, enhancement and

reinstatement of endemic species. This will ensure and improved long-term outcome for the management of weeds within Cattai Creek and fund in perpetuity conservation actions to be carried on the land and provide long-term protection to high biodiversity values.

### 9.1.3 THREATENED FLORA SPECIES

*Eucalyptus scoparia* (Wallangarra White Gum) is listed as endangered under the BC Act and Vulnerable under the EPBC Act. This species is only known to occur in three populations near Tenterfield, Girraween National Park on the NSW QLD border and on the Stanthorp Plateau in QLD. This species occurs in a range of habitats including open eucalypt forest, woodland and heaths on well-drained Granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes. The site is outside the natural geographic range of this species and does not contain the habitat for the Eucalyptus scoparia.

*Eucalyptus scoparia* (Wallangarra White Gum) is commonly planted as a landscape and a street tree throughout NSW. As the site does not contain the natural habitat for this species, credit species are not required to offset for the removal of this species within the site.
No other threatened flora species or their habitat, listed under BC Act, have been determined to be affected by the concept proposal.

### 9.1.4 THREATENED FAUNA SPECIES

No threatened fauna species or their habitat, listed under BC Act, within the site will be adversely affected by the concept proposal. An increase in indirect impacts from the concept proposal will include an increase in noise and vibration within the site and immediate surrounds, including Cattai Creek are likely due to vegetation clearing, ground disturbance, machinery and vehicle movements. As currently there is high noise levels and light levels currently occurring the increase in light and noise would be minor. These impacts would be managed in accordance with the CMP concept proposal which will be part of future DA's to be lodged.

## 9.2 SERIOUS AND IRREVERSIBLE IMPACTS

### 9.2.1 THREATENED ECOLOGICAL COMMUNITIES

No Serious and Irreversible Impacts to threatened ecological community entities under the BC Act were recorded within the site.

### 9.2.2 THREATENED SPECIES

No Serious and Irreversible Impacts to threatened species entities under the BC Act were recorded within the site.

## 9.3 PRESCRIBED BIODIVERSITY IMPACTS

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

### 9.3.1 AREAS OF GEOLOGICAL SIGNIFICANCE

No areas of geological significance are present. No caves for breeding by bats are present.

### *9.3.2 HUMAN MADE STRUCTURES AND NON-NATIVE VEGETATION*

#### 9.3.2.1 HUMAN MADE STRUCTURES

No human made structures have been identified within the Site that would provide suitable habitat for any threatened species. A reinforced concrete box cell culvert adjacent to the site that could provide temporary roosting sites for microbats. This culvert was inspected during the field surveys and no microbats (or signs of microbats e.g. guano) were recorded. There are no lift holes, and the culvert join seams are sealed. This culvert will not be impacted by the development. Furthermore, no microbats were recorded during the Anabat survey.

#### 9.3.2.2 NON-NATIVE VEGETATION

The site consists small area of non-native vegetation, which includes gardens, exotic palms and exotic grassland. The non-native vegetation has been mapped as part of the Miscellaneous ecosystem - urban exotic / native landscape vegetation type which also contains planted native trees. All of this miscellaneous ecosystem will be removed as part of the concept proposal. The non-native vegetation contains potential foraging habitat for the Grey-headed Flying-fox and as outlined in Section 9.4 the impact upon this foraging habitat for this species is likely to be minor due the large areas of better-quality habitat within the vicinity of the site.

### *9.3.3 CONNECTIVITY AND MOVEMENT*

Connectivity and movement impacts will be addressed as part of future DA's applications for the concept proposal and have not been assessed in this report.

### *9.3.4 HYDROLOGY*

The development lot - precinct east drains into the Carrington Road drainage system which drains to the west into Cattai Creek (WSP, 2019). Pollutants and an increase in sediment have the potential to have an impact upon Cattai Creek to the west of the site. An Integrated Water Cycle Management Strategy for the site has been undertaken by WSP (2019). This report established the current water quality environment of the site and identified measures to protect the receiving environment from adverse water quality impacts. Stormwater treatment to mitigate any potential indirect impacts include the installation of rainwater tanks, installation of gross pollutant traps and filtration devices at major discharge points and linear bioretention garden beds. The concept proposal will not result in any adverse changes to the local hydrology, if the above mitigation measures are implemented and the development has been designed to maintained existing compensatory flood storage levels.

### *9.3.5 VEHICLE STRIKE*

The site is in a busy urban area within Sydney, subject to high levels of vehicular traffic. The development lot - precinct east will increase the number of truck and light vehicle movements per day. This would increase the risk of fauna mortality or injury because of vehicle strike. Use of vehicles and plant during construction also increase the risk of fauna mortality in areas adjacent to the site. Few terrestrial fauna species occur in the site that are at risk of vehicle strike. The increased risk of vehicle strike is unlikely to have a substantial impact on any local populations of fauna species.

## 9.4 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Given the general lack of habitat present and small area of mostly non-native vegetation to be removed, the concept proposal is considered unlikely to result in a significant impact on any MNES.

In respect to the Grey-headed Flying-fox (*Pteropus poliocephalus*), whilst it is considered to have a low likelihood of site habitat utilisation, it is recognised that the site does contain a small number (37) of Eucalypt and Melaleuca trees that may provide occasional foraging opportunities for this species. Future DA's that will be lodged will determine the

number of trees to be removed. However, even if all of these trees were to be removed, the impact upon the Grey-headed Flying-Fox would be minor (0.87ha foraging) as there are larger, better quality areas of habitat within the vicinity of the site. An assessment of significance has been undertaken for this species (Appendix G). This assessment has concluded that the concept proposal is unlikely to result in a significant impact on the Grey-headed Flying-fox (*Pteropus poliocephalus*).

A referral of this concept proposal to the Department of the Environment and Energy is not warranted.

## 9.5 OTHER IMPACTS

### *9.5.1 GROUNDWATER DEPENDENT ECOSYSTEMS*

The site occurs on the soil landscapes of Glenorie Landscape overlying the Wianamatta Group shales and the Hawkesbury Landscape comprising shallow bedrock and the potential for minor colluvial sediments within the south-western portion of the site (JBS & G, 2019). JBS & G, (2019) identified two potential groundwater systems are to occur within the site:

- A shallow unconfined to semi-confined aquifer system within the within the unconsolidated soils of the Glenorie Landscape and
- A deeper confined groundwater system resident in primary and secondary porosity of the Ashfield Shale/Hawkesbury Sandstone.

The Miscellaneous ecosystem – Urban exotic / native landscape plantings vegetation type contains large eucalypt trees. These trees are likely to rely of surface water for their water requirements. However, the trees may access groundwater on an intermittent basis during drought conditions. Most of the trees will be removed with any retained trees unlikely to be impacted by any groundwater drawdown that may occur as a result of the concept proposal.

# 10 MITIGATION MEASURES AND ENVIRONMENTAL RISK ASSESSMENT

An environmental risk analysis has been conducted to identify potential environmental impacts associated with the concept proposal. This analysis comprises a qualitative assessment consistent with AS/NZS ISO 31000:2009 Risk Management–Principles and Guidelines (Standards Australia 2009). The level of risk was assessed by considering the potential impacts of the proposed development prior to application of any mitigation or management measures.

Risk comprises the likelihood of an event occurring and the consequences of that event. For the concept proposal, the following descriptors were adopted for 'likelihood' and 'consequence' (Table 10.1).

Table 10.1 Risk descriptors

| **LIKELIHOOD** | | **CONSEQUENCE** | |
|---|---|---|---|
| A | Almost certain | 1 | Widespread and/or irreversible impact |
| B | Likely | 2 | Extensive but reversible (within 2 years) impact or irreversible local impact |
| C | Possible | 3 | Local, acceptable or reversible impact |
| D | Unlikely | 4 | Local, reversible, short term (<3 months) impact |
| E | Rare | 5 | Local, reversible, short term (<1 month) impact |

The risk levels for likely and potential impacts were derived using the following risk matrix (Table 10.2).

Table 10.2 Risk matrix

| | | **LIKELIHOOD** | | | | |
|---|---|---|---|---|---|---|
| | | A | B | C | D | E |
| **CONSEQUENCE** | 1 | High | High | Medium | Low | Very Low |
| | 2 | High | High | Medium | Low | Very Low |
| | 3 | Medium | Medium | Medium | Low | Very Low |
| | 4 | Low | Low | Low | Low | Very Low |
| | 5 | Very Low | Very Low | Very Low | Very Low | Very Low |

The results of the environmental risk assessment for the concept proposal are presented in Table 10.3. It is considered that the level of risk to biodiversity is considered generally low and with the mitigation measures required, the impacts resulting from the concept proposal will be acceptable. The impacts outlined in Table 10.3 are likely to occur during the demolition of the council administration building and any other future developments within the for the Site. Further mitigation measures may be required as part of the conditions of consent for each of the future developments prior to approval.

Table 10.3 Risk assessment and mitigation measures

| MATTER | POTENTIAL IMPACT | LIKELIHOOD | CONSEQUENCE | RISK LEVEL | PROPOSED MITIGATION MEASURES |
|---|---|---|---|---|---|
| Biodiversity Impact | Removal of vegetation | B | 3 | Medium | Replanting of landscape areas to incorporate native species (Landscape Plan and Design Guidelines).<br>Tree Protection zones be incorporated to protect any retained native trees within the Site. |
| | Impact on threatened flora species | E | 3 | Very Low | No mitigation is required as the occurrence of any threatened flora species is considered unlikely. |
| | Impact on threatened and native fauna species | C | 3 | Medium | A pre-clearing survey would be undertaken by a suitably qualified ecologist, prior to the removal of any trees. This should be included in the CMP. |
| | Impact on adjacent Cattai Creek | D | 4 | Low | Best practise erosion and sedimentation controls in accordance with approved CMP<br>Weed control in accordance with approved CMP. |

# 11 OFFSETTING

Biodiversity offset requirements for the concept proposal have been assessed in accordance with the BC Act, FM Act and EPBC Act. No biodiversity offset obligation has been deemed necessary for the concept proposal. Details relating to the concept proposal biodiversity offset assessment for each legislative control is provided below.

## 11.1 BC ACT - OFFSET FOR AFFECTED THREATENED BIOTA

Biodiversity offsetting for residual impacts on BC Act biodiversity values is mandatory for SSD concept proposals being assessed under Part 7 of the Act and subject to a BDAR. A biodiversity offset obligation however is not required under the thresholds for the assessment and offsetting of impacts of concept proposal as the vegetation within the development lot - precinct east consists of urban and native species plantings.

## 11.2 FM ACT - OFFSETTING OF IMPACTS ON KEY FISH HABITATS

The concept proposal would not result in impacts to any area of key fish habitat and as such no offset obligation under the FM Act are deemed warranted.

## 11.3 EPBC ACT - OFFSET FOR AFFECTED THREATENED BIOTA

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

# 12 CONCLUSION

No remnant native vegetation or associated Plant Community Types were recorded in the site or development lot - precinct east. The absence of any remnant native vegetation is the result of clearing for urban development.

One non-native vegetation type was recorded within the development lot - precinct east, being:

- Miscellaneous ecosystem – urban exotic / native landscape plantings (0.87ha)

No threatened flora species, ecological communities or their habitat, listed under the BC Act, have been determined to be affected by the concept proposal. One threatened fauna species being the Grey-headed Flying-fox was recorded flying over the adjoining Cattai Creek to the west of the site.

No direct impacts will result on any remnant native vegetation or associated PCTs within the development lot - precinct east. The concept proposal has the potential to have indirect impacts to Cattai Creek which occurs to the west of the site. These indirect impacts include stormwater runoff and the transport of weeds. Mitigation measures will be implemented, to reduce these impacts.

Given the concept proposal will not have any direct impacts on PCTs and only minor impacts upon the adjoining Cattai Creek the BOS is not applicable for this development.

The concept proposal is considered unlikely to result in a significant impact on any Matters of National Environmental Significance (MNES). Given this, a referral of this development under the EPBC Act to the Department of the Environment and Energy is not warranted.

# 13 LIMITATIONS

## 13.1 SCOPE OF SERVICES

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

## 13.2 RELIANCE ON DATA

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

## 13.3 ENVIRONMENTAL CONCLUSIONS

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

## 13.4 REPORT FOR BENEFIT OF CLIENT

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

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# APPENDIX A

## LIKELIHOOD OF OCCURENCE OF THREATENED FLORA

# A1 LIKELIHOOD OF OCCURRENCE OF THREATENED FLORA

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Acacia bynoeana* | Bynoe's Wattle | E | V | Occurs in heath or dry sclerophyll forest on sandy soils.<br>Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.<br>Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple. | 3 | BioNet; PMST | Low. Preferred habitat in the form of sandy soils, not recorded within the Site. |
| *Acacia gordonii* | - | E | E | Occurs in the lower Blue Mountains from Bilpin to Faulconbridge and also in the Glenorie district. Grows on sandstone outcrops and amongst rock platforms in dry sclerophyll forest and heath. Specifically this species occurs in Sydney Sandstone Ridgetop Communities. | 0 | PMST | Low. Preferred habitat, Sandstone Ridgetops, not recorded within the Site. |
| *Acacia pubescens* | Downy Wattle | V | V | Restricted to the Sydney Region from Bilpin to the Georges River and also at Woodford where it usually grows in open sclerophyll forest and woodland on clay soils. Typically it occurs at the intergrade between shales and sandstones in gravely soils often with ironstones. | 14 | BioNet; PMST; PlantNet | Low. No habitat for this species occurs within the Site. |
| *Allocasuarina glareicola* | - | E | E | Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows on lateritic soil in open forest. | 0 | PMST | Low. Preferred habitat, lateritic soils, not recorded within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Asterolasia elegans* | - | E | E | Known from only seven populations, north of Sydney in the Baulkham Hills, Hawkesbury and Hornsby LGAs; also likely to occur in the western part of Gosford LGA. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (*Syncarpia glomulifera subsp. glomulifera*), Smooth-barked Apple (*Angophora costata*), Sydney Peppermint (*Eucalyptus piperita*), Forest Oak (*Allocasuarina torulosa*) and Christmas Bush *Ceratopetalum gummiferum.* | 0 | PMST | Low. Preferred habitat, Hawkesbury sandstone sheltered forests, not recorded within the Site. |
| *Caladenia tessellata* | Thick Lip Spider Orchid | E | V | Occurs south of Swansea where it grows on clay loam or sandy soils. Prefers low open forest with a heathy or sometimes grassy understorey. Within NSW, currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Previously known also from Sydney and South Coast areas. | 0 | PMST | None. Site is outside of species known distribution. |
| *Callistemon linearifolius* | Netted Bottle Brush | V | Not listed | Occurs chiefly from Georges to the Hawkesbury River where it grows in dry sclerophyll forest, open forest, scrubland or woodland on sandstone. Found in damp places, usually in gullies. Within the Sydney region, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. | 0 | PlantNet | Low. Preferred habitat in the form of sandstone geologies not recorded within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Cryptostylis hunteriana* | Leafless Tongue Orchid | V | V | Occurs south from the Gibraltar Range, chiefly in coastal districts but also extends on to tablelands. Grows in swamp-heath and drier forest on sandy soils on granite & sandstone. Occurs in small, localised colonies most often on the flat plains close to the coast but also known from some mountainous areas growing in moist depressions and swampy habitats. | 0 | PMST | Low. Preferred habitat in the form of swamp-heath and sandstone geologies not recorded within the Site. |
| *Cynanchum elegans* | White-flowered Wax Plant | E | E | Occurs from the Gloucester district to the Wollongong area and inland to Mt Dangar where it grows in rainforest gullies, scrub and scree slopes. This species typically occurs at the ecotone between dry subtropical forest/woodland communities. | 0 | PMST | Low. Preferred habitat, rainforest gullies, scrub and scree slopes, not recorded within the Site. |
| *Darwinia biflora* | - | V | V | Occurs from Cheltenham to Hawkesbury River where it grows in heath on sandstone or in the understorey of woodland on shale-capped ridges. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include *Eucalyptus haemastoma, Corymbia gummifera* and/or *E. squamosa*. The vegetation structure is usually woodland, open forest or scrub-heath. | 81 | PMST PlantNet | Low. Preferred habitat in the form of sandstone geologies and shale-capped sandy soils not recorded within the Site. |
| *Dillwynia tenuifolia* | - | V | Not listed | Occurs on the Cumberland Plain from the Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite. Specifically, occurs within Castlereagh woodlands, particularly in shale gravel transition forest. Associated species include *Eucalyptus fibrosa, E. sclerophylla, Melaleuca decora, Daviesia ulicifolia, Dillwynia juniperina* and *Allocasuarina littoralis.* | 1 | BioNet | Low. Associated vegetation communities not recorded within Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Dillwynia tenuifolia* - endangered population | Dillwynia tenuifolia, Kemps Creek | E2 | Not listed | This populations occupancy area is bounded by western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool Local Government Area. | 1 | BioNet | Low. The Site is outside of the population's distribution |
| *Epacris purpurascens var. purpurascens* | - | V | Not listed | Occurs in Gosford and Sydney districts where it grows in sclerophyll forest, scrub and swamps. Usually found in sites with a strong shale influence. | 204 | BioNet; PlantNet | Low. Preferred habitat, soils with a strong shale influence, not recorded within the Site. |
| *Eucalyptus camfieldii* | Heart-leaved Stringybark | V | V | Occurs in scattered locations within a restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Grows in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone, in coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include Brown Stringybark (*E. capitellata*), Scribbly Gum (*E. haemastoma*), Narrow-leaved Stringybark (*E. oblonga*), Silvertop Ash (*E. sieberi*), Smooth-barked Apple (*Angophora costata*), Dwarf Apple (*A. hispida*), Red Bloodwood (*Corymbia gummifera*), Scrub She-oak (*Allocasuarina distyla*), Slender Tea Tree (*Leptospermum trinervium*), and Fern-leaved Banksia (*Banksia oblongifolia*). | 1 | BioNet; PMST | Low. Preferred habitat, shallow sandy soils, not recorded within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Eucalyptus nicholii* | Narrow-leaved Black Peppermint | V | V | Occurs from Niangala to Glenn Innes where it grows in grassy sclerophyll woodland on shallow relatively infertile soils on shales and slates, mainly on granite. Endemic on the NSW Northern Tablelands, of limited occurrence, particularly in the area from Walcha to Glen Innes; often on porphyry or granite. | 4 | BioNet | None. Site is outside of species known distribution. |
| *Eucalyptus sp. Cattai* | - | CE | CE | Occurs in the area between Colo Heights and Castle Hill in north-western Sydney, with historical records from central Sydney. It grows as an emergent tree in scrub, heath and low woodland on sandy soils, generally on flat ridge tops. It usually occurs as isolated individuals or occasionally in small clustered groups. Associated soils are laterised clays overlying sandstone. | 88 | BioNet; PMST; PlantNet | Low. Preferred habitat, sandy soils on ridgetops, not recorded within the Site. |
| *Eucalyptus scoparia* | Wallangarra Gum | E | V | A small tree to 15 m tall with a smooth powdery white to pale grey bark. In NSW it is known from only three locations near Tenterfield, including Bald Rock National Park. In Queensland it is equally rare, occurring at three sites on the Stanthorp Plateau including one population in Girrawween National Park. Found in open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes. At lower elevations can occur in less rocky soils in damp situations. | 1 | BioNet | Low. This species was recorded within the Site, however it is planted along the road verge and it is outside of species known distribution. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Genoplesium baueri* | Bauers Midge Orchid | V | E | Grows in dry sclerophyll forest and moss gardens over sandstone. The species has been recorded from locations between Ulladulla and Port Stephens. About half the records were made before 1960 with most of the older records being from northern Sydney suburbs. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. | 0 | PMST | Low. Preferred habitat, sandstone geology, not recorded within the Site. |
| *Hibbertia superans* | - | E | Not listed | Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, where there are currently 16 known sites, and at one locality at Mount Boss, inland from Kempsey. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as trackside. | 94 | BioNet; PlantNet | Low. Preferred habitat, Sandstone Ridgetops, not recorded within the Site. |
| *Leucopogon fletcheri subsp. fletcheri* | - | E | Not listed | Restricted to north-western Sydney between St Albans in the north and Annangrove in the south, within the local government areas of Hawkesbury, Baulkham Hills and Blue Mountains. Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Grows in dry eucalypt woodland or in shrubland on clay, lateritic soils or Hawkesbury sandstone. Found on sandstone ridges and upper slopes in heath or woodland, sometimes in or below sandstone-shale ecotone; often associated with lateritic soils with some clay influence. | 5 | BioNet | Low. Site does not provide suitable habitat. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Lasiopetalum joyceae* | - | V | V | This species is an erect shrub to 2m tall. Has a restricted range occurring on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River. It is currently known from 34 sites between Berrilee and Duffys Forest. Seventeen of these are reserved. Heath on sandstone is habitat for this species. | - | PMST | Low. Site does not provide suitable habitat. |
| *Leptospermum deanei* | Deane's Tea-tree | V | V | Shrub to 5 m, with bark peeling in long strips. Occurs in Hornsby, Warringah, Ku-ring-gai and Ryde LGAs. Woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone.<br>Occurs in Riparian Scrub - e.g. *Tristaniopsis laurina, Baechea myrtifolia;* Woodland - e.g. *Eucalyptus haemstoma;* and Open Forest - e.g. *Angophora costata, Leptospermum trinervium, Banksia ericifolia*.<br>Flowers October-November. | - | PMST | Low. Site does not provide suitable habitat. |
| *Melaleuca biconvexa* | Biconvex Paperbark | V | V | Occurs as disjunct populations in coastal New South Wales from Jervis Bay to Port Macquarie, with the main concentration of records is in the Gosford/Wyong area. Grows in damp places, often near streams, or low-lying areas on alluvial soils of low slopes or sheltered aspects. | 0 | PMST | Low. Site does not provide suitable habitat. |
| *Melaleuca deani* | Dean's Paperbark | V | V | Occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. | 3 | Bionet; PlantNet; PMST | Low. Preferred habitat, Sandstone Ridgetops, not recorded within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Persicaria elatior* | Tall Knotweed | V | V | Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. | 0 | PMST | Low. No habitat for this species occurs within the Site. |
| *Persoonia hirsuta* | Hairy Geebung | E | E | The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. It has a large area of occurrence, but occurs in small populations. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone or very rarely on shale. Often occurs in areas with clay influence, in the ecotone between shale and sandstone. | 15 | BioNet; PMST; PlantNet | Low. No habitat for this species occurs within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Persoonia mollis* | - | E | E | Restricted to the Hornsby Heights, Mt Colah area north of Sydney. It occurs on sheltered upper hillsides of narrow gullies of Hawkesbury sandstone characterised his by steep sideslopes, rocky benches and broken scarps, with creeks fed by small streams and intermittent drainage depressions. It grows in moist, tall forest (*Angophora costata, Eucalyptus piperita, Corymbia gummifera*), often with warm temperate rainforest influences (*Syncarpia glomulifera, Ceratopetalum apetalum, Callicoma serratifolia*). Sometimes recorded in low densities on the dry upper-hillsides of gullies and in more exposed aspects in association with *E. haemastoma* and *E. punctata.* | 1 | BioNet; PMST | Low. Site is outside of species known locality. |
| *Pimelea curviflora var. curviflora* | - | V | V | Confined to coastal areas around Sydney where it grows on sandstone and laterite soils. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville, but its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Usually occurs in woodland in the transition between shale and sandstone, often on Lucas Heights soil landscape. | 33 | BioNet; PMST; PlantNet | Low. Preferred geologies not recorded within the Site. |
| *Pimelea spicata* | Spiked Rice-flower | E | E | This species occurs in two disjunct areas: in coastal districts from Lansdowne to Shellharbour, and in Cumberland Plain Woodland inland to Penrith. In western Sydney it grows on Wianamatta Shales in Greybox - Ironbark Woodland with *Bursaria spinosa* and *Themeda triandra*. In the Illawarra, it occurs on well structured clay soils in grassland or open woodland. | 0 | PMST | Low. No suitable habitat for this species occurs within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Pterostylis gibbosa* | Illawarra Greenhood | E | E | All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage.<br>In the Illawarra region, the species grows in woodland dominated by Forest Red Gum *Eucalyptus tereticornis*, Woollybutt *E. longifolia* and White Feather Honey-myrtle *Melaleuca decora*. Near Nowra, the species grows in an open forest of Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata*. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri*. | 0 | PMST | Low. The species has not been recorded within the locality and the Site is outside the known population distribution within the Sydney Basin Bioregion.<br>This species is considered extinct in western Sydney. |
| *Pterostylis saxicola* | Sydney Plains Greenhood | E | E | Known now only from Freemans Reach to Picton district. Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where *Pterostylis saxicola* occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils. | 0 | PMST; PlantNet | Low. No habitat for this species occurs within the Site. |
| *Pultenaea parviflora* | - | E | V | Restricted to the Cumberland Plain where it grows in dry sclerophyll forest on Wianamatta shale, laterite or alluvium. Locally abundant within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. Also occurs in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. | 0 | PMST | Low. Preferred habitat, transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland, not recorded within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS [2] | HABITAT [3] | BIONET RECORDS | SOURCE [4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Rhodamnia rubescens* | Scrub Turpentine | CE | - | Shrub or small tree to 25m in height. Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Occurs in littoral, warm temperate, and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. | 1 | BioNet; | Low. Preferred geologies and littoral, warm temperate, and subtropical rainforest and wet sclerophyll forest not present within the Site. |
| *Syzygium paniculatum* | Magenta Lilly Pilly | E | V | Occurs between Bulahdelah and St Georges Basin where it grows in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. | 10 | BioNet; PMST | Low. No habitat for this species occurs within the Site. |

| SCIENTIFIC NAME | COMMON NAME | BC ACT STATUS [1] | EPBC ACT STATUS[2] | HABITAT[3] | BIONET RECORDS | SOURCE[4] | LIKELIHOOD OF OCCURRENCE |
|---|---|---|---|---|---|---|---|
| *Tetratheca glandulosa* | Glandular Pink-bell | V | V | Occurs from Mangrove Mountain to the Blue Mountains where it grows in sandy or rocky heath or scrub. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop Woodland (Map Unit 10ar). Common woodland tree species include: *Corymbia gummifera, C. eximia, Eucalyptus haemastoma, E. punctata, E. racemosa*, and/or *E. sparsifolia*, with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. | 27 | BioNet; PlantNet | Low. Preferred habitat, sandstone geologies and ridgetop woodland, not recorded within Site. Associated species not recorded. |
| *Thesium australe* | Austral Toadflax | V | V | Grows in grassland or woodland often in damp sites. It is a semi-parasitic herb and hosts are likely to be *Themeda triandra* and *Poa spp.* | 0 | PMST | Low. The species has not been recorded within the locality and the Site is outside the known population distribution within the Sydney Basin Bioregion. |

# APPENDIX B

## LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA

# B1 LIKELIHOOD OF OCCURRENCE OF THREATENED FAUNA

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
|---|---|---|---|---|---|---|---|
| Green and Golden Bell Frog | *Litoria aurea* | E | V | This species occurs in fragment patches near coastal locations from Vic to south of the NSW-QLD border. For breeding it utilises a wide range of waterbodies, including both natural and man-made structures, such as marshes, dams and stream sides, and ephemeral wetlands. It is found in small pockets of habitat in otherwise developed areas and can occur in disturbed sites. There is a clear preference for sites with a complexity of vegetation structure and terrestrial habitat attributes which include extensive grassy areas and an abundance of shelter sites such as rocks, logs, tussock forming vegetation and other cover used for foraging and shelter. Over winter, shelter sites may be adjacent to or some distance away from breeding sites but the full range of possible habitat used is not yet well understood. | BioNet (1)<br>PMST | Low. Marginal suitable habitat recorded within the subject land. No recent records within locality of the Site. | Not considered further |
| Red-crowned Toadlet | *Pseudophryne australis* | V | - | Occurs within 160 km of Sydney where it is restricted to Hawkesbury Sandstone. It breeds in deep grass and debris adjacent to ephemeral drainage lines. When not breeding individuals are found scattered on sandstone ridges under rocks and logs. | BioNet | Low. Species is restricted to Hawkesbury Sandstone. This geology was not recorded within the Site. | Not considered further |
| Barking Owl | *Ninox connivens* | V | - | Occurs in dry sclerophyll woodland. In the south west it is often associated with riparian vegetation while in the south east it generally occurs on forest edges. It nests in large hollows in live eucalypts, often near open country. It feeds | BioNet (8) | Low. Marginal habitat in the form of dry sclerophyll woodlands and riparian vegetation recorded. One hollow equal or larger than 20cm in diameter was | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
|---|---|---|---|---|---|---|---|
| | | | | on insects in the non-breeding season and on birds and mammals in the breeding season. | | recorded adjacent to the Site. Species unlikely to rely on habitat and due to its small size the habitat is unlikely to support this species. | |
| Black Bittern | *Ixobrychus flavicollis* | V | - | Usually found in dense vegetation in and fringing streams, swamps, tidal creeks and mudflats, particularly amongst swamp she-oaks and mangroves. Feeds on aquatic fauna along streams, in estuaries and beside billabongs and pools. Breeding occurs in summer in secluded places in densely vegetated wetlands. It nests in trees that overhang the water. | BioNet (3) | Low. Marginal habitat in the form of one freshwater stream with dense vegetation on fringes, species unlikely to rely on habitat of poor quality. | Not considered further |
| Black-chinned Honeyeater (eastern subspecies) | *Melithreptus gularis gularis* | V | - | Occurs within areas of annual rainfall between 400-700 mm. Feed on insects, nectar and lerps. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum *(E. blakelyi*) and Forest Red Gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Feeding territories are large making the species locally nomadic. It tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. | BioNet (1) | Low. Less than 1 hectare of suitable foraging habitat was recorded within the Site. | Not considered further |
| Dusky Woodswallow | *Artamus cyanopterus cyanopterus* | V | - | The Dusky Woodswallow is widespread in eastern, southern and southwestern Australia. In New South Wales it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the | BioNet (22) | Low. Preferred habitat not recorded within Site. | Not considered further. |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | Upper Western region. Often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. At sites where Dusky Woodswallows are recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris. Birds are also often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber. In western New South Wales this species is primarily associated with River Red Gum/Black Box/Coolibah open forest/woodland associated with larger river/creek systems and is less common and far more patchily distributed in other communities such as mallee and cypress-pine woodland. | | | |
| Eastern Bristlebird | *Dasyornis brachypterus* | E | E | The habitat of the Eastern Bristlebird is characterised by low dense vegetation. Fire is a feature of all areas where known populations occur. Given the poor flight ability of the species it is though that few individuals survive the passage of fire, survival is dependant on the availability of fire refuges and recolonisation may be relatively slow. The bird is cryptic and camouflaged and rarely seen but may be detected by its distinctive, loud calls. Confined to NSW/Queensland border region, Illawarra region and NSW/Victorian border region. | PMST | Low. Species is considered unlikely to utilise the study area given its small extent and limited connectivity to larger patches of remnant vegetation. This species is known to have a limited flight ability. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| Flame Robin | *Petroica phoenicea* | V | - | The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. | BioNet (2) | Low. Preferred habitat, moist eucalypt forest on ridges or slopes, not recorded within the Site. | Not considered further |
| Gang-gang Cockatoo | *Callocephalon fimbriatum* | V | - | Occurs in wetter forests and woodland from sea level to an altitude over 2000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens. | BioNet (6) | Low. Marginal foraging habitat recorded within the subject land. Prefers heavily well-timbered habitat in mature wet sclerophyll forests. May occur irregularly by foraging in greater locality but is unlikely to regularly utilise or rely on the habitat within the Site. | Not considered further |
| Gang-gang Cockatoo population in Hornsby and Ku-ring-gai LGA's | *Callocephalon fimbriatum* | E | - | Occurs within a variety of forest and woodland types. Usually frequents forested areas with old growth attributes required for nesting and roosting purposes. Also utilises less heavily timbered woodlands and urban fringe areas to forage, but appears to favour well-timbered country through which it habitually flies as it moves about. | BioNet (2) | Low. Poor foraging and breeding habitat recorded within the subject land. May occur irregularly but unlikely to regularly utilise habitat within Site. | Not considered further |
| Glossy Black-Cockatoo | *Calyptorhynchus lathami* | V | - | The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of | BioNet (4) | Low. Marginal foraging habitat of species (Casuarina) recorded within the Site. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis)* and Forest Sheoak (*A. torulosa)* are important foods. Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. | | | |
| Little Eagle | *Hieraaetus morphnoides* | V | - | The Little Eagle is distributed throughout the Australian mainland occupying habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Prey includes birds, reptiles and mammals, with the occasional large insect and carrion. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion. Most of its former native mammalian prey species in inland NSW are extinct and rabbits now form a major part of the diet. | Bionet (1) | Low. Marginal foraging habitat within Site. Locality is generally industrial or residential with limited remnant vegetation. May occur irregularly whilst foraging in locality. | Not considered further |
| Little Lorikeet | *Glossopsitta pusilla* | V | - | The Little Lorikeet is a small green lorikeet with black bill and red patch on forehead and throat. The underside is yellow-green. Immatures are duller with less red on face and brown bill. Found in forests, woodland, treed areas along watercourses and roads. Forages mainly on flowers, nectar and fruit. Found along coastal east Australia from Cape | BioNet (7) | Low. Species may utilise the Site seasonally when eucalyptus are in blossom. | Not considered further. |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | York in Queensland down east coast and round to South Australia. Uncommon in southern Victoria. | | | |
| Masked Owl | *Tyto novaehollandiae novaehollandiae* | V | | Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. | BioNet (2) | Low. Although one hollow equal or larger than 20cm in diameter was recorded adjacent to the Site, the species is unlikely to rely on habitat due to its small size. | Not considered further |
| Pink Robin | *Petroica rodinogaster* | V | - | The pink robin is found in Tasmania and the uplands of eastern Victoria and far south-eastern NSW, almost as far north as Bombala. On the mainland, the species disperses north and west and into more open habitats in winter, regularly as far north as the ACT area, and sometimes being found as far north as the central coast of NSW. Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. | BioNet (1) | Low. Preferred habitat not within Site. | Not considered further |
| Powerful Owl | *Ninox strenua* | V | - | A sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, Casuarina or Callitris pine forest and woodland. It often roosts in denser vegetation including rainforest of exotic pine plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require | BioNet (135) | Low. Species may utilise the Site for foraging. Historically recorded in locality. One hollow equal or larger than 20cm in diameter was recorded within adjacent riparian zone. No nest trees identified in subject land. | Not considered further. |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | a shrub layer and owls are more often found in areas with more old trees and hollows than average stands. | | | |
| Regent Honeyeater | *Anthochaera phrygia* | CE | CE | Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding. Spotted Gum and Swamp Mahogany forests are also important feeding areas in coastal areas. Important food trees include *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box), *E. melliodora* (Yellow Box) and *E. leucoxylon* (Yellow Gum). | BioNet (1) | Low. Site provides generally unsuitable habitat. Important food trees not recorded. Prefers more intact forests where larger patches of blossom resources occur. Rare occurrences under suitable seasonal conditions cannot be discounted. | Not considered further |
| Square-tailed Kite | *Lophoictinia isura* | V | - | The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. | BioNet (4) | Low. Species is unlikely to utilise Site due to its higher urbanised nature providing few foraging opportunities and limited breeding habitat. | Not considered further |
| Superb Parrot | *Polytelis swainsonii* | V | V | Found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of | BioNet (2) | Low. Site is outside of species known and predicted distribution. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Tree species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain. | | | |
| Swift Parrot | *Lathamus discolor* | E | CE | Breeding occurs in Tasmania, majority migrates to mainland Australia in autumn, over-wintering, particularly in Victoria and central and eastern NSW, but also south-eastern Queensland as far north as Duaringa. Until recently it was believed that in New South Wales, swift parrots forage mostly in the western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region, but new evidence indicates that the forests on the coastal plains from southern to northern NSW are also extremely important. In mainland Australia it is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, | BioNet (10) | Low. Species may utilise Site for foraging during seasonal blossom occurrences. Breeding occurs in Tasmania. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | and for sites with flowering Acacia pycnantha, is indicated. Sites used vary from year to year. | | | |
| Turquoise Parrot | *Neophema pulchella* | V | - | The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. | BioNet (1) | Low. Species is unlikely to utilise the Site due to its small extent and limited resources. | Not considered further |
| Varied Sittella | *Daphoenositta chrysoptera* | V | Not listed | The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. | BioNet (2) | Low. Species is unlikely to utilise the Site due to its small extent and limited resources. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
|---|---|---|---|---|---|---|---|
| White-throated Needletail | *Hirundapus caudacutus* | Not listed | V | Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns. Breeds in the northern hemisphere and migrates to Australia in October-April. | PMST | Low. Although species may use aerial spaces above Site. it is unlikely to occur within terrestrial vegetation within the Site. | Not considered further |
| Cumberland Plain Land Snail | *Meridolum corneovirens* | E | Not listed | Restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River Flat Forest, especially where it meets Cumberland Plain Woodland. It is typically found under logs and other debris, amongst leaf litter and bark around bases of trees. It is also sometimes found under grass clumps and where possible it will burrow into loose soil. | BioNet (1) | Low. Preferred habitat not recorded within the Site. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| Dural Woodland Snail | *Pommerhelix duralensis* | E | E | This species prefers the interface of shale-derived and sandstone- derived soils with forested habitats that contain a good native cover and woody debris. It favours shelter under rocks, inside curled-up bark or resting in exposed areas and does not burrow or climb. | BioNet (28) PMST | Low. Preferred habitat, transition soils, not recorded within the Site. | Not considered further |
| Brush-tailed Rock-wallaby | *Petrogale penicillate* | E | V | Occurs in inland and sub-coastal south eastern Australia where it inhabits rock slopes. It prefers rocks which receive sunlight for a considerable part of the day. Windblown caves, rock cracks or tumbled boulders are used for shelter. Occur in small groups or "colonies" each usually separated by hundreds of metres. | PMST | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation. | Not considered further |
| Eastern False Pipistrelle | *Falsistrellus tasmaniensis* | V | Not listed | Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high. | BioNet (13) | Low. Suitable roosting habitat recorded within the Site. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
|---|---|---|---|---|---|---|---|
| Eastern Cave Bat | *Vespadelus troughtoni* | V | | Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. | BioNet (1) | Low. Breeding habitat not identified within Site. Species may utilise the vegetation for foraging habitat. | Not considered further |
| Eastern Coastal Freetail-bat | *Mormopterus norfolkensis* | V | - | The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. | BioNet (25) | Low. Suitable habitat not recorded within the Site. | Not considered further |
| Greater Broad-nosed Bat | *Scoteanax rueppellii* | V | - | The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings. | BioNet (14) | Low. Suitable habitat not recorded within the Site. | Not considered further |
| Large Bent-winged-Bat | *Miniopterus orianae oceanensis* | V | Not listed | The Large-bent winged-Bat occurs along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but they can also use derelict mines, storm-water tunnels, buildings and other man-made structures. They form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Hunt in rainforest, wet and dry sclerophyll forest, | 63 (Bionet) | Low. Breeding habitat not identified within subject land. Species may utilise the vegetation for foraging habitat. This species is considered as an Ecosystem credit species only. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
|---|---|---|---|---|---|---|---|
| | | | | monsoon forest, open woodland, Melaleuca forests and open grasslands. | | | |
| Grey-headed Flying-fox | *Pteropus poliocephalus* | V | V | Occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly. At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, elsewhere, during spring, Grey-headed Flying-foxes are uncommon south of Nowra and widespread in other areas of their range. The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. In winter, the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW (associated with flowering Spotted Gum *Corymbia maculata*) and on the northwest slopes (generally associated with flowering White Box *Eucalyptus albens* or Mugga Ironbark *E. sideroxylon).* Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in | BioNet (223) PMST | **Recorded**. The closest camp is at Gordon about 20km away. Two individuals were seen flying over subject land. Species may utilise the vegetation during blossom period for foraging habitat as part of their broader home range. | Assessment of Significance completed. Conclusion: **Not Significant** |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. | | | |
| Koala | *Phascolarctos cinereus* | V | V | The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabits eucalypt woodlands and forests. Koalas Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. The preferred tree species vary widely on a regional and local basis. Some preferred species include Forest Red Gum *Eucalyptus tereticornis*, Grey Gum *E. punctata*. In coastal areas, Tallowwood *E. microcorys* and Swamp Mahogany *E. robusta* are important food species, while in inland areas White Box *E. albens*, Bimble Box *E. populnea* and River Red Gum *E. camaldulensis* are favoured. | BioNet (4) PMST | Low. The Site has limited connectivity to larger patches of remnant vegetation and is unlikely to support the Koala. | Not considered further |
| Southern Myotis | *Myotis macropus* | V | - | Found in most habitat types in association with streams and permanent waterways usually at low elevations in flat or undulating landscapes from northern areas of Western Australia, and the Northern Territory, down the entire east coast and the southern coast of Australia to just west of the Victoria/South Australia border and inland along the Murray River. Roosts in caves, tree hollows, in clumps of dense vegetation (e.g. Pandanus), mines, tunnels, under bridges, road culverts and stormwater drains often in abandoned, intact Fairy Martin nests. Roost sites are strongly associated | BioNet (10) | Low. Species may utilise the subject lands for breeding and foraging. Bridge culverts and small hollows recorded within adjacent riparian zone but no Myotis were present. | Not considered further |

| COMMON NAME | SCIENTIFIC NAME | BC ACT[1] | EPBC ACT[2] | HABITAT[3] | SOURCE | LIKELIHOOD OF OCCURRENCE | OUTCOME |
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| | | | | with bodies of water where this species commonly feeds on aquatic insects, shrimp and small fish at the water surface, however, aerial foraging for other insects is also known. Breeding habitat likely to coincide with roosting habitat. | | | |
| Spotted-tailed Quoll | *Dasyurus maculatus* | V | E | Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold (NSW National Parks and Wildlife Service, 1999g). Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods. | BioNet (1) PMST | Low. Vegetation within the subject land considered unsuitable due to its small extent and limited connectivity to larger patches of remnant vegetation. | Not considered further |
| Yellow-bellied Sheathtail-bat | *Saccolaimus flaviventris* | V | - | This species is widespread through tropical Australia and migrates to southern Australia in summer. Occurs in eucalypt forest where it feeds above the canopy and in mallee or open country where it feeds closer to the ground. Generally a solitary species but sometimes found in colonies of up to 10. It roosts and breeds in tree hollows but has also been recorded roosting under exfoliating bark, in burrows of terrestrial mammals, in soil cracks and under slabs of rock and in the nests of bird and sugar gliders. | BioNet (18) | **Moderate**. Species may utilise the Site for foraging and breeding. Small hollows recorded within adjacent riparian zone. | Not considered further |

# APPENDIX C

RECORDED FLORA

# C1 RECORDED FLORA

| FAMILY | **SCIENTIFIC NAME** | **COMMON NAME** |
|---|---|---|
| Apiaceae | *Cyclospermum leptophyllum** | Slender Celery |
| Apocynaceae | *Araujia sercifera** | Moth Vine |
| Arecaceae | *Archontophoenix alexandrae** | Alexander Palm |
| Arecaceae | *Butia capitata** | Jelly Palm |
| Arecaceae | *Howea forsteriana* | Kentia Palm |
| Arecaceae | *Phoenix canariensis** | Canary Island Date Palm |
| Arecaceae | *Syagrus romanzoffiana** | Cocos Palm |
| Asteraceae | *Aster subulatus** | Wild Aster |
| Asteraceae | *Bidens pilosa** | Cobbler's Pegs |
| Asteraceae | *Cirsium vulgare** | Scotch Thistle |
| Asteraceae | *Conyza bonariensis** | Flaxleaf Fleabane |
| Asteraceae | *Conyza sumatrensis** | Tall fleabane |
| Asteraceae | *Cotula australis* | Common Cotula |
| Asteraceae | *Erechtites valerianifolius** | Brazilian Fireweed |
| Asteraceae | *Euchiton involucratus* | Star Cudweed |
| Asteraceae | *Facelis retusa** | Annual Trampweed |
| Asteraceae | *Gamochaeta calviceps** | Cudweed |
| Asteraceae | *Gamochaeta purpurea** | Purple Cudweed |
| Asteraceae | *Latuca serriola** | Prickly Lettuce |
| Asteraceae | *Sonchus oleraceus** | Common Sowthistle |
| Asteraceae | *Taraxacum officinale** | Dandelion |
| Bignoniaceae | *Jacaranda mimosifolia** | Jacaranda |
| Brassicaceae | *Brassica rapa** | Field Mustard |
| Brassicaceae | *Lepidium bonariensa** | - |
| Caryophyllaceae | *Polycarpon tetraphyllum** | Four-leaved Allseed |
| Caryophyllaceae | *Stellaria media** | Common Chickweed |
| Casuarinaceae | *Casuarina cunninghamiana* | River Oak |
| Casuarinaceae | *Casuarina glauca* | Swamp Oak |
| Chenopodiaceae | *Einadia hastata* | Berry Saltbush |
| Commelinaceae | *Commelina cyanea* | Native Wandering Jew |

| FAMILY | **SCIENTIFIC NAME** | **COMMON NAME** |
|---|---|---|
| Convolvulaceae | *Dichondra repens* | Kidney Weed |
| Cyperaceae | *Cyperus congestus** | - |
| Cyperaceae | *Cyperus eragrostis** | Umbrella Sedge |
| Elaeocarpaceae | *Elaeocarpus reticulatus* | Blueberry Ash |
| Euphorbiaceae | *Euphorbia peplus** | Petty Spurge |
| Euphorbiaceae | *Euphorbia prostrata** | Red Caustic Weed |
| Fabaceae (Faboideae) | *Lotus subbiflorus** | Hairy Birds-foot Trefoil |
| Fabaceae (Faboideae) | *Trifolium arvense** | Haresfoot Clover |
| Fabaceae (Faboideae) | *Trifolium dubium** | Yellow Suckling Clover |
| Fabaceae (Faboideae) | *Trifolium repens** | White Clover |
| Fabaceae (Faboideae) | *Vicia sativa* subsp. *sativa** | Common Vetch |
| Geraniaceae | *Geranium molle** | Cranesbill Geranium |
| Lamiaceae | *Stachys arvensis** | Stagger Weed |
| Lomandraceae | *Lomandra longifolia* | Spiny-headed Mat-rush |
| Malvaceae | *Sida rhombifolia** | Paddy's Lucerne |
| Malvaceae | *Modiola caroliniana** | Red-flowered Malva |
| Myrtaceae | *Callistemon* sp. (Cultivar) | - |
| Myrtaceae | *Corymbia maculata* | Spotted Gum |
| Myrtaceae | *Eucalyptus paniculata* | Grey Ironbark |
| Myrtaceae | *Eucalyptus scoparia* | Wallangarra White Gum |
| Myrtaceae | *Eucalyptus sideroxylon* | Mugga Ironbark |
| Myrtaceae | *Leptospermum polygalifolium* | Tantoon |
| Myrtaceae | *Lophostemon confertus* | Brush Box |
| Oxalidaceae | *Oxalis corniculata** | - |
| Pinaceae | *Cedrus deodara** | Himalayan Cedar |
| Phormiaceae | *Dianella caerulea* var. *caerulea* | Blue Flax lily |
| Plantaginaceae | *Plantago lanceolata** | Lamb's Tongues |
| Poaceae | *Avena fatua** | Wild Oats |
| Poaceae | *Bromus catharticus** | Prairie Grass |
| Poaceae | *Cenchrus clandestinus** | Kikuyu |
| Poaceae | *Cynodon dactylon* | Common Couch |
| Poaceae | *Ehrharta erecta** | Panic Veldtgrass |
| Poaceae | *Eragrostis curvula** | African Lovegrass |

| FAMILY | **SCIENTIFIC NAME** | **COMMON NAME** |
|---|---|---|
| Poaceae | *Imperata cylindrica* | Blady Grass |
| Poaceae | *Poa annua** | Winter Grass |
| Poaceae | *Sporobolus africanus** | Parramatta Grass |
| Poaceae | *Setaria parviflora** | Pigeon Grass |
| Polygonaceae | *Rumex crispus** | Curled Dock |
| Primulaceae | *Lysmachia arvensis** | Scarlet Pimpernel |
| Rosaceae | *Photinia serratifolia** | Chinese Photinia |
| Rubiaceae | *Galium aparine** | Goosegrass |
| Solanaceae | *Solanum nigrum** | Black-berry Nightshade |
| Verbenaceae | *Verbena bonariensis** | Purpletop |
| Xanthorrhoeaceae | *Xanthorrhoea glauca* | Grass Tree |

# APPENDIX D

RECORDED FAUNA

# D1 RECORDED FAUNA

| FAMILY NAME | *SCIENTIFIC NAME* | COMMON NAME |
|---|---|---|
| Artamidae | *Gymnorhina tibicen* | Australian Magpie |
| Corvidae | *Corvus coronoides* | Australian Raven |
| Campephagidae | *Coracina novaehollandiae* | Black-faced Cuckoo-shrike |
| Accipitridae | *Accipiter fasciatus* | Brown Goshawk |
| Columbidae | *Ocyphaps lophotes* | Crested Pigeon |
| Psittacidae | *Platycercus eximius* | Eastern Rosella |
| Psophodidae | *Psophodes olivaceus* | Eastern Whipbird |
| Cacatuidae | *Eolophus roseicapilla* | Galah |
| Alcedinidae | *Dacelo novaeguineae* | Laughing Kookaburra |
| Cacatuidae | *Cacatua sanguinea* | Little Corella |
| Charadriidae | *Vanellus miles* | Masked Lapwing |
| Psittacidae | *Glossopsitta concinna* | Musk Lorikeet |
| Meliphagidae | *Manorina melanocephala* | Noisy Miner |
| Anatidae | *Anas superciliosa* | Pacific Black Duck |
| Artamidae | *Strepera graculina* | Pied Currawong |
| Psittacidae | *Trichoglossus haematodus* | Rainbow Lorikeet |
| Ptilonorhynchidae | *Ptilonorhynchus violaceus* | Satin Bowerbird |
| Cacatuidae | *Cacatua galerita* | Sulphur-crested Cockatoo |
| Hirundinidae | *Hirundo neoxena* | Welcome Swallow |
| Accipitridae | *Haliastur sphenurus* | Whistling Kite |
| Acanthizidae | *Sericornis frontalis* | White-browed Scrubwren |
| ***Mammals*** | | |
| Phalangeridae | *Trichosurus vulpecula* | Common Brushtail Possum |
| Pseudocheiridae | *Pseudocheirus peregrinus* | Common Ringtail Possum |
| Pteropodidae | *Pteropous poilocephalus* | Grey-headed Flying-fox |
| ***Amphibians*** | | |
| Hylidae | *Litoria phyllochroa* | Green Stream Frog |
| ***Reptiles*** | | |
| Scincidae | *Tiliqua scincoides* | Blue-tongue Lizard |
| Agamidae | *Itellagama lesueurii* | Eastern Water Dragon |

# APPENDIX E

## EPBC ACT SIGNIFICANCE ASSESSMENT

# E1 GREY-HEADED FLYING-FOX EPBC SIGNIFICANCE ASSESSMENT

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

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

**Is this part of an important population?**

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

The site does not contain suitable habitat for breeding camps nor does it occur within proximity to a known camp. Nearby breeding camps include those at Wolli Creek (24 kilometres to the south east), Gordon (20 kilometres to the east) and Centennial Park (30 kilometres to the south east). Therefore, a population of Grey-headed Flying-fox in the site is not considered to be important, as no breeding sites would be affected by the concept proposal.

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

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

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

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

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

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

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

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

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

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

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

The concept proposal will result in a negligible loss of sub-optimal foraging habitat that is limited to a small number of planted Eucalypt and Melaleuca species. As this species is highly mobile, with individuals foraging up to 50 km from camp sites, it is unlikely that the concept proposal would adversely affect habitat critical to the survival of this species.

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

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

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

No. The concept proposal will result in a negligible loss of sub-optimal foraging habitat that is limited to a small number of planted Eucalypt species. As this species is highly mobile, with individuals foraging up to 50 km from camp sites, it is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

No. It is unlikely that invasive species (such as introduced predators) that are harmful to the Grey-headed Flying-fox would become further established because of the concept proposal.

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

No. There are no known diseases that are likely to increase in the area because of the concept proposal.

**Interfere with the recovery of the species**

No. Given the concept proposal will result in a negligible loss of sub-optimal foraging habitat that is limited to a small number of planted Eucalypt species it is unlikely that it would interfere with the recovery of the species.

**Conclusion**

The concept proposal will result in a negligible loss of sub-optimal foraging habitat that is limited to a small number of planted Eucalypt species (0.87 ha). There were no Grey-headed Flying-fox camps within the site or its vicinity, but there are camps in the wider region. The loss of this resource is unlikely to be significant to local populations in the wider locality. Therefore, habitat attributes occurring within the site are not considered important to the long-term survival of the Grey-headed Flying-fox.

# APPENDIX F

## SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

# F1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS