



---

# Travers

bushfire & ecology

---

## Biodiversity Assessment Report (FBA Methodology)

Corner Bernera Road and  
Yarrunga Street, Prestons

MARCH 2016  
(REF: A15182FBA)





# Biodiversity Assessment Report (FBA Methodology)

**Lots 33, 34, 35 & 43 DP 2359 & Lot 20 DP 1173483,  
Corner Bernera Road and Yarrunga Street, Prestons**

**MARCH 2016**

Report Authors: Michael Sheather-Reid – Senior Ecologist  
(Accredited Biobanking Assessor No# 204)  
Lindsay Holmes B. Sc. - Senior Botanist  
(Accredited Biobanking Assessor No# 199)  
Approved by: Michael Sheather-Reid  
Date: 3 March 2016  
File: A15182FBA

This document is copyright © *Travers bushfire & ecology* 2016

## **Disclaimer:**

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person including the client then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy. Consequently, the location of all mapped features is to be confirmed by a registered surveyor.

ABN 64 083 086 677  
PO Box 7138  
Kariong NSW 2250

38A The Avenue  
Mt Penang Parklands  
Central Coast Highway  
Kariong NSW 2250

t: 02 4340 5331  
e: [info@traverseecology.com.au](mailto:info@traverseecology.com.au)  
[www.traverseecology.com.au](http://www.traverseecology.com.au)



# Executive Summary

*Travers Bushfire and Ecology* has been engaged by *DBL Property Pty Limited* to prepare a Biodiversity Assessment Report (BAR) in accordance with the Framework for Biodiversity Assessment Methodology (FBA) for an industrial development for State Significant Development (SSD, 7155), located on the corner of Bernera Road and Yarrunga Street at Prestons, within the local government area (LGA) of Liverpool.

## **Purpose of the BAR**

The aim of the BAR is to assess the potential impacts of the proposed SSD application on flora and fauna and has been prepared in accordance with the NSW Framework for Biodiversity Assessment 2014 (OEH 2014a). The report responds to the Secretary's Environmental Assessment Requirements (SEARs) as they relate to flora and fauna, as shown in italics below:

*All impacts on native vegetation on the site should be avoided wherever possible and, if not avoided, suitably offset. Potential impacts should be assessed in accordance with relevant Office of Environment and Heritage guidelines, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995.*

This report has been prepared by Accredited BioBanking Assessors - Michael Sheather-Reid No# 204 and Lindsay Holmes No# 199.

## **BAR assessment results**

The project involves the full removal of native vegetation. The total amount of native vegetation amounts to 0.48 ha, over a total area of 20.725 ha. The 0.48 ha is covered in three (3) small patches, the largest being 0.31 ha in the far north-east corner of the study area.

Avoidance of such patches had not been considered feasible and retention of such vegetation would be of limited ecological value. There is no likely value in restoring the existing remnants and regenerating the habitat connectivity in the future due to the zoning of surrounding lands and lack of other remnants adjoining the development site.

The probable recording by Anabat of either Eastern Freetail-bat or Greater Broad-nosed bat has assumed both species are present given there are local and recent records for both species. There will be habitat loss for both species equating to 0.48 ha and removal of five (5) hollow-bearing trees.

The impact on biodiversity has been assessed by using the BioBanking credit calculator, which considers landscape values, patch size, quality of vegetation and fauna habitat. The resulting ecosystem credits are:

- 14 ecosystem credits for ME020 (Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin);
- 11 species credits for Eastern Freetail-bat; and
- 11 species credits for Greater Broad-nosed Bat.

These required ecosystem credits can be purchased from a BioBank site within the same or an adjoining IBRA sub-region. It is noted that the proponent, has proposed using revegetation works onsite as a means of offsetting the loss of habitat and native vegetation onsite. This approach is subject to further discussion with and the approval of the Determining Authority.

There is potential for indirect impacts to surrounding lands but they are expected to be relatively well filtered given the proposed revegetation works around the perimeter of the site as a screening to adjoining properties. Indirect impacts could include but not be limited to:

- Sedimentation and run off;
- Noise, dust and light spill;
- Impacts to adjoining vegetation and habitat;
- Introduction of feral pests, weeds and pathogens;
- Infrequent or cumulative impacts; and
- Operations phase impacts (trampling of vegetation, rubbish dumping, noise etc).

#### *Summary of state matters – terrestrial biodiversity*

In respect of matters required to be considered under the *Environmental Planning and Assessment Act 1979* and relating to the species / provisions of the *Threatened Species Conservation Act 1995*, the following were recorded within development site:

- Acquiring and retiring of 14 BioBanking ecosystem credits in order to offset residual direct impacts, i.e. clearing of native vegetation and loss of fauna habitat.
- Cumberland Plain Woodland, assigned to PCT 849, ME020. Approximately 0.48 ha of degraded vegetation will be required to be cleared within the development site and does not form significant habitat for threatened species;
- Species credits are required for
  - Eastern Freetail-bat – 11 credits
  - Greater Broad-nosed Bat – 11 credits
- Cumberland Plain Land Snail (*Meridolum corneovirens*). The Cumberland Plain Land Snail was not recorded within the Development Site. No offsets are required for this species;
- No threatened flora species were not recorded within the Development Site. No offsets are required for this species.

#### *Summary of state matters – aquatic biodiversity*

In respect of matters relative to the *Fisheries Management Act 1994*, no suitable habitat for threatened marine or aquatic species was observed within the development site and there are no matters requiring further consideration under this Act.

#### *Summary of Commonwealth matters*

In respect of matters required to be considered under the *Environment Protection and Biodiversity Conservation Act 1999*, the following were recorded within the development site:

- No protected migratory bird species;
- No threatened flora species; and
- No TECs.

The proposed project is not considered to have a significant impact on matters of national environmental significance. As such a referral to DoE is not required.

## Discussion of proposed offsetting strategy

The proponent has put forward two options for meeting the requirements of the required credits:-

- a. Providing revegetation offsets within the site of undetermined biodiversity ecosystem credit value and gaining the balance from the biobanking market
- b. Full sourcing of the required ecosystem and species credits in accordance with the FBA methodology from the biobanking market

These two options are considered below.

### Use of revegetation offsets within the site

The proponent has proposed the use of 0.92 ha of revegetation areas within the proposed development site to offset part or all of the required credits. The arguments being that under a normal Part 5 development assessment, the CPW remnants would most likely not be conserved and revegetation works accepted as a suitable compensation for that loss. Given that the proposal will remove 0.48ha and revegetate 0.92 ha, the outcome appears in principle to be a reasonable proposition.

In accordance with the BioBanking Assessment Methodology (BBAM 2014), the acquiring and retirement of credits is to be acquired from a BioBank site. The proponent requests the determining authority to approve a variation to this approach.

The proposed revegetation areas do have ecological value for the following reasons:

- Maintain a vegetated habitat stepping stone within the site suitable for resident and common fauna species;
- Are able to contain hollow habitat for hollow dependent threatened species;
- Assist in restoring maintaining CPW within the locality within a revegetated and managed landscape; and
- Provide ongoing vegetated visual screening.

The relative biodiversity offset credit value of the revegetation areas would need to be assessed against the required credits to determine the remaining credits required to be purchased from a Biobank site.

### Sourcing of required credits to offset the loss of biodiversity value

An assessment of sourcing the required ecosystem and species credits is provided within section 8.7 of this report. In summary and in accordance with the FBA Methodology, the required ecosystem credits can be obtained & retired via the following mechanisms:

- Biobank site expressions of interest (EOI) register – sourcing the required credits from landowners who are interested in establishing biobank sites, but have not entered into a biobanking agreement.
- Credits wanted register – register the required credits on the credit wanted register to allow other assessors to link with proponents who are seeking biodiversity credits.

- Varying the rules to match PCT 849 on the project lands to PCT 850 in the same IBRA sub-region given it has similar values, forms part of the same TSC CEEC and has the same amount cleared. PCT 849 is not available on the BioBanking Public Register as at 29/02/16, however there are several available PCT 850 sites that would satisfy the 14 ecosystem credits required.
- Use variations and supplementary measures to offset the species credits required given that there are currently no species credits available for Eastern Freetail-bat and Greater Broad-nosed Bat. There are no species credits available for any Chiroptera, hence alternative or supplementary measures are required. It is recommended that OEH be contacted in regard to applying for additional ecosystem credits of PCT 850 as a supplementary measure as it would likely provide suitable habitat for those two (2) threatened fauna species that species credits cannot be obtained.
- Sourcing and establishing a biobank site of equivalent or greater credit value.

This report concludes that using the variations and supplementary measures the required offsets can be sourced from the open biobank market by:

1. Varying the rules to allow to match PCT 849 on the project lands to PCT 850 in the same IBRA sub-region. Ecosystem credits for PCT 850 are available from the BioBanking Public Register therefore all ecosystem credits can be sourced and retired.
2. Use variations and supplementary measures to offset the 22 species credits required by applying for additional ecosystem credits of PCT 850 to be used to supplement the required species credits.
3. Sourcing and establishing a biobank site with the required ecosystem and species credits.

# Table of Contents

<b>SECTION 1.0 – INTRODUCTION .....</b>	<b>1</b>
1.1 Purpose .....	1
1.2 Project description .....	2
1.2.1 Location .....	4
1.2.2 Identification of development site footprint .....	5
1.3 General description of development site .....	5
1.4 Information sources .....	6
1.4.1 Database analysis .....	6
1.4.2 Literature review .....	6
1.4.3 Aerial photography.....	6
<b>SECTION 2.0 - LEGISLATION AND POLICIES .....</b>	<b>11</b>
2.1 Commonwealth.....	11
2.1.1 Environment Protection and Biodiversity Conservation Act 1999 .....	11
2.1.2 Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy .....	11
2.2 New South Wales .....	12
2.2.1 Environmental Planning and Assessment Act 1979 .....	12
2.2.2 Threatened Species Conservation Act 1995 .....	12
2.2.3 Fisheries Management Act 1994.....	12
2.2.4 NSW Biodiversity Offsets Policy for Major Projects .....	13
<b>SECTION 3.0 – LANDSCAPE FEATURES .....</b>	<b>14</b>
3.1 Landscape features .....	14
3.1.1 IBRA bioregions and IBRA subregions.....	14
3.1.2 Mitchell Landscapes .....	15
3.1.3 Rivers and streams .....	16
3.1.4 Wetlands.....	16
3.1.5 Native vegetation extent .....	16
3.1.6 State or regionally significant biodiversity links.....	17
3.1.7 Other landscape features.....	17
3.2 Landscape value score .....	17
3.2.1 Attributes .....	17
3.2.2 Score .....	18
<b>SECTION 4.0 - NATIVE VEGETATION .....</b>	<b>19</b>
4.1 Review of existing data .....	19
4.2 Field survey .....	19
4.3 Native vegetation extent within the development site .....	20
4.4 Identification of plant community types.....	23
4.4.1 Threatened ecological communities.....	27
4.4.2 Description of PCTs within the development site .....	30
4.5 Vegetation zones .....	30
4.6 Groundwater dependent ecosystems.....	31
<b>SECTION 5.0 – THREATENED SPECIES AND POPULATIONS.....</b>	<b>33</b>
5.1 Review of existing data .....	33
5.2 Field survey .....	33
5.2.1 Habitat assessment .....	33
5.2.2 Targeted threatened species surveys .....	33
5.2.3 Survey limitations.....	37
5.3 Fauna habitats within the development site .....	37

5.3.1	Woodland habitat.....	37
5.3.2	Aquatic habitat.....	38
5.4	Ecosystem credit species.....	38
5.4.1	Predicted ecosystem credit species.....	38
5.5	Species credit species.....	40
5.5.1	Candidate species credit species.....	40
5.5.2	Candidate species for further assessment.....	40
5.5.3	Presence of candidate species.....	45
<b>SECTION 6.0 – AVOID AND MINIMISE IMPACTS .....</b>		<b>46</b>
6.1	Avoidance measures.....	46
6.2	Mitigation measures.....	47
6.3	Impacts that cannot be avoided or mitigated.....	47
<b>SECTION 7.0 - IMPACT SUMMARY .....</b>		<b>54</b>
7.1	Introduction.....	54
7.1.1	Direct loss of native vegetation.....	54
7.1.2	Direct loss of fauna habitat.....	54
7.2	Thresholds for assessing unavoidable impacts.....	55
<b>SECTION 8.0 – CONCLUSION .....</b>		<b>60</b>
8.1	Purpose of the BAR.....	60
8.2	Land use history and context of the land.....	60
8.3	Summary of scale and extent of impacts.....	60
8.4	Summary of state matters – terrestrial biodiversity.....	61
8.5	Summary of state matters – aquatic biodiversity.....	61
8.6	Summary of Commonwealth matters.....	62
8.7	Biodiversity offset strategy.....	62
8.7.1	Revegetation offsets.....	62
8.7.2	Sourcing required ecosystem end species credits from the BioBank market..	62
8.7.3	Sourcing of required credits to offset the loss of biodiversity value.....	67

# Figures

Figure 1 – Study area.....	1
Figure 2 – Proposed development and master landscape plan.....	3
Figure 3 – Site locality.....	4
Figure 4 – Land zoning.....	5
Figure 5 – Site map.....	8
Figure 6 – Location map.....	9
Figure 7 – Development site footprint.....	10
Figure 8 – IBRA bioregions.....	14
Figure 9 – Approximate location of site within IBRA subregion SYB08.....	15
Figure 10 – PCT within the development site.....	25
Figure 11 – TECs within the development site.....	29
Figure 12 – Vegetation zones in the development site.....	32
Figure 13 – Plot transect locations in the development site.....	34
Figure 14 – Target species survey within the development site.....	35
Figure 15 – Potential direct impacts within the development site.....	52
Figure 16 – Potential indirect impacts within the development site.....	53
Figure 17 – Areas not requiring assessment within the development site.....	58
Figure 18 – PCTs requiring offsetting within the development site.....	59

# Tables

Table 1 – Site features .....	6
Table 3.1 - Current and future extent of native vegetation within the assessment circles .....	17
Table 4.1 – Plot and transect survey effort .....	20
Table 4.2 – PCT 849 description .....	24
Table 4.3 – Summary of PCT occurring within the development site .....	24
Table 4.4 – TECs associated with PCT occurring within the development site .....	27
Table 4.5 – Evaluation of ME020 at the development site against EPBC Act listing advice thresholds .....	28
Table 4.6 – Vegetation zones within the development site .....	31
Table 5.1 – Fauna survey effort .....	36
Table 5.2 – Hollow-bearing tree data .....	38
Table 5.3 – Predicted ecosystem credit species .....	39
Table 5.4 – Assessment of specific geographic / habitat features .....	40
Table 5.5 – Species for consideration from the credit calculator tool .....	40
Table 5.6 – Assessment of potential presence of species credit species .....	41
Table 5.7 – Summary of surveys undertaken for candidate species credit species .....	45
Table 6.1 – Summary of direct impacts .....	48
Table 6.2 - Extent and scale of indirect impacts .....	51
Table 7.1 - Summary of ecosystem credits required .....	54
Table 7.2 - Summary of credit species credits required .....	55
Table 7.3 - Thresholds for the assessment and offsetting of unavoidable impacts of the project .....	55
Table 8.1 - Ecosystem credits available for ME019 (PCT 850) - Cumberland Plain Woodland .....	64
Table A1 - Plot transect data from the development site .....	71
Table B1 – Flora species list for the development site .....	73
Table C1 – Fauna species list from the development site .....	76

# Appendices

- Appendix A – Plot and Transect Data
- Appendix B – Flora Species List
- Appendix C – Fauna Species List
- Appendix D – Biobanking Report

# List of abbreviations

AHD	Australian Height Datum
BAR	Biodiversity Assessment Report
BBAM	BioBanking Assessment Methodology
BOM	Bureau of Meteorology
BOS	Biodiversity Offset Strategy
CPW	Cumberland Plain Woodland
DA	Development Application
DECCW	Department of Environment Climate Change and Water
Development site	The project disturbance area
DoE	Commonwealth Department of the Environment
DP&E	NSW Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FBA	Framework for Biodiversity Assessment
FFA	Flora and Fauna Assessment
FM Act	NSW <i>Fisheries Management Act 1994</i>
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation for Australia
Inner assessment circle	A 100 ha area surrounding the development site
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	NSW Office of Environment and Heritage of the Department of Premier and Cabinet
Outer assessment circle	A 1000 ha area of the development site
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TEC	Threatened Ecological Community
the project	The proposal to impact the full extent of the 20.725 ha for a future industrial area containing several warehouses, car parking, services and landscaping / restoration
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
VIS	Vegetation Information System



# Introduction

# 1

*Travers Bushfire and Ecology* has been engaged by *DBL Property Pty Limited* to prepare a Biodiversity Assessment Report (BAR) in accordance with the Framework for Biodiversity Assessment Methodology (FBA) for an industrial development for State Significant Development (SSD, 7155), located on the corner of Bernera Road and Yarrunga Street at Prestons, within the local government area (LGA) of Liverpool (Figure 1).

## 1.1 Purpose

This BAR has been prepared to inform a SSD application. The aim of the BAR is to assess the potential impacts of the proposed development on flora and fauna and has been prepared in accordance with the NSW Framework for Biodiversity Assessment 2014 (OEH 2014a). The report responds to the Secretary's Environmental Assessment Requirements (SEARs) as they relate to flora and fauna, as shown in italics below:

*All impacts on native vegetation on the site should be avoided wherever possible and, if not avoided, suitably offset. Potential impacts should be assessed in accordance with relevant Office of Environment and Heritage guidelines, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995.*

This report draws upon information within a previous ecological assessment undertaken by *Travers bushfire & ecology* in 2015 and has been prepared by Accredited Biobanking Assessors - Michael Sheather-Reid No# 204 and Lindsay Holmes No# 199.



Figure 1 – Study area

## 1.2 Project description

The current zoning of the land is IN1 and IN3. The proposal for the site is for a staged development for a new warehouse and distribution estate based on the layout provided in Figure 2. The layout of the five (5) warehouse and office facilities that will result in all existing native vegetation being removed.

The plan for the estate includes new landscaping and planting using native species endemic to the area. Included in the Estate are two (2) areas which are aimed at revegetating Cumberland Plain Woodland community (see Figure 2). These areas include:

1. A 20 metre wide buffer planting area that located on the Kurrajong Road frontage where a deliberate effort has been made to introduce a new dense planting area that can physically separate the new industrial estate from the residential area on the other side of the road. It will be replanted with Cumberland Plain Woodland species. There is also a 10 metre wide buffer off Yarrunga Street, however this will be planted with Eucalypts, Casuarinas and Turpentine. The new area total covers 8,262 m<sup>2</sup>;
2. Another smaller area located in the centre of the estate aims at providing an outdoor park like area suitable for workers to enjoy their lunch etc. The area is part of a wider open space area but specific new planting employing Cumberland Plain Woodland species will be replanted in an area of some 970 m<sup>2</sup>. This area does have the main function of protecting an Aboriginal heritage site.

An electrical easement is present within the site and is approximately 60m wide. All electrical easements are excluded from the biodiversity assessment area and are not able to be used for offsetting purposes.

The loss of native vegetation on site amounts to 0.48 ha in total. The proposal seeks to assist in mitigating the loss of the remnant vegetation by undertaking revegetation along the road interface. The total amount of revegetation offered amounts to 0.9232 ha, although some of which is located under the power easement and cannot be planted with shrubs generally over 4m.



Figure 2 – Proposed development and master landscape plan

### 1.2.1 Location

The site is located to the west of the M7 in the suburb of Prestons which is within the Liverpool LGA. It borders Yarrunga Street to the north, Bernera Road to the east, and Kurrajong Road to the south. An overview of the site is shown on Figure 3.

Surrounding land use to the north and east is similar to that proposed for the site, being industrial related, and the site occurs upon lands zoned as IN1 and IN3 under the Liverpool Local Environmental Plan (LEP), 2008, amended October 2014 (see Figure 4).

The site is currently being used as a rural lot with a residence and grazing animals.



Figure 3 – Site locality

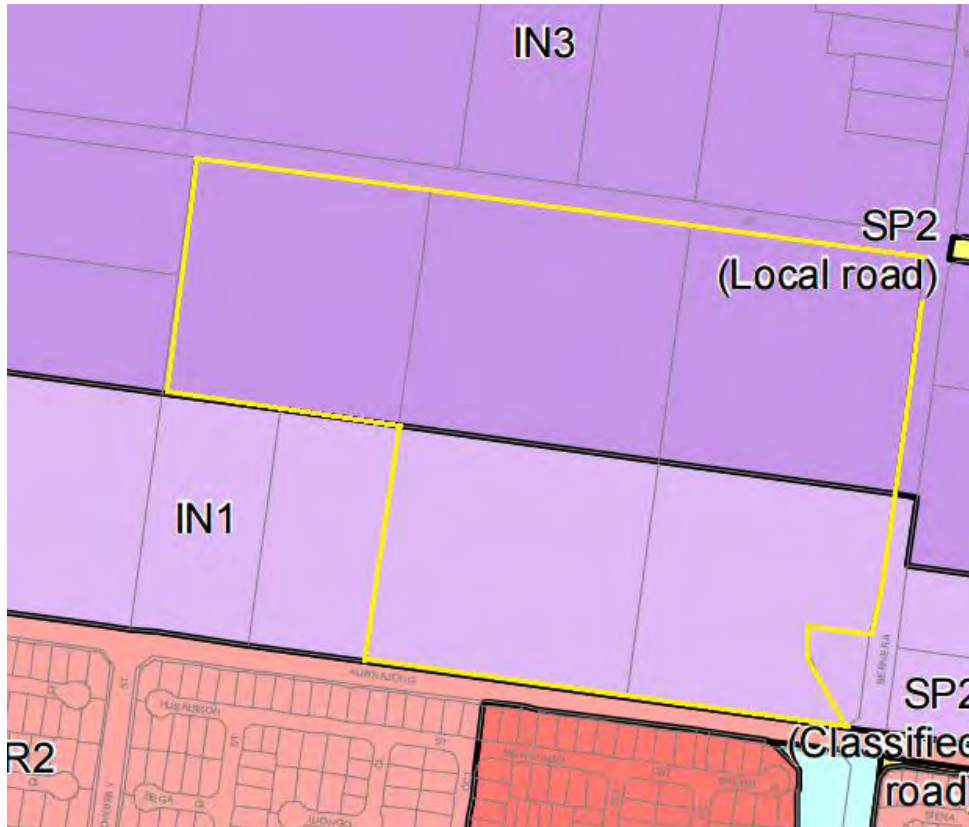


Figure 4 – Land zoning

### 1.2.2 Identification of development site footprint

The extent of the construction, operational and revegetation areas will encompass the entire site of 20.725 ha (by title).

## 1.3 General description of development site

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

There are two dwellings in the north-western corner of Lot 34 with ancillary rural infrastructure such as several stock yards, multiple sheds of varying sizes and a planted (mostly exotic) household garden. There are also two small sheds and some scattered debris within Lot 43.

Lots 20 and 33 contain a high voltage power line which runs north-south and a constructed drainage channel emanating from filter discharge pipes in the southern boundary of Lot 20 and exiting the eastern boundary of Lot 33.

There is a small dam located in the north-western corner of Lot 35 and another dam located offline from the drainage channel in the south-eastern corner of Lot 33.

**Table 1 – Site features**

<b>Location</b>	Lots 33, 34, 35 & 43 DP 2359 & Lot 20 DP 1173483, 5-35 Yarrunga Road, Prestons
<b>Size</b>	20.725 ha
<b>Local government area</b>	Liverpool
<b>Grid reference</b>	302700E 6242450N
<b>Topography</b>	The study area is over gentle slopes between 0 and 5 degrees
<b>Geology</b>	Geology – Bringelly Shale. Soils – Bankstown Soil Landscape
<b>Catchment and drainage</b>	Cabramatta Creek
<b>Vegetation</b>	Small patches of remnant Cumberland Plain Woodland persist on site
<b>Existing land use</b>	Grazing with residences
<b>Clearing</b>	The entire site has been cleared and managed with only a few very small patches or individual trees remaining. Generally there are no shrubs except along the fence lines or within the road reserve.

## 1.4 Information sources

### 1.4.1 Database analysis

A number of databases were utilised as part of this assessment, including:

- Atlas of NSW Wildlife (Bionet);
- EPBC coordinate search tool;
- Threatened Species Profile Database;
- Vegetation Information System (VIS) Classification Database;
- Department of Primary Industries threatened and protected species – records viewer; and
- Bureau of Meteorology (BOM).

### 1.4.2 Literature review

A review of ecological literature relevant to the development site was undertaken as part of this assessment to evaluate the biodiversity values. Key documents reviewed for this BAR include:

- Pre DA lodgement notes, October 2014
- Development plans, drawing SK-A 1901 by Axis Architectural, October 2015
- SEAR's for SSD 7155 dated September 2015
- Relevant sections of Liverpool's LEP 2008
- Detailed survey provided by LandPartners Built Environment Consultants, March 2015
- Sydney Metropolitan Catchment Management Authority vegetation mapping (2013).
- Groundlink provided the landscaping plans.

### 1.4.3 Aerial photography

The BAR has utilised two (2) sources of aerial imagery:

- NearMap dated 16/10/2015.
- Google Earth cited to Aerometrex dated 1-01-2014.

The following figures provide a background to the site layout and location:

- Figure 5 - Site map
- Figure 6 - Location map
- Figure 7 - Development site footprint



Figure 5 – Site map

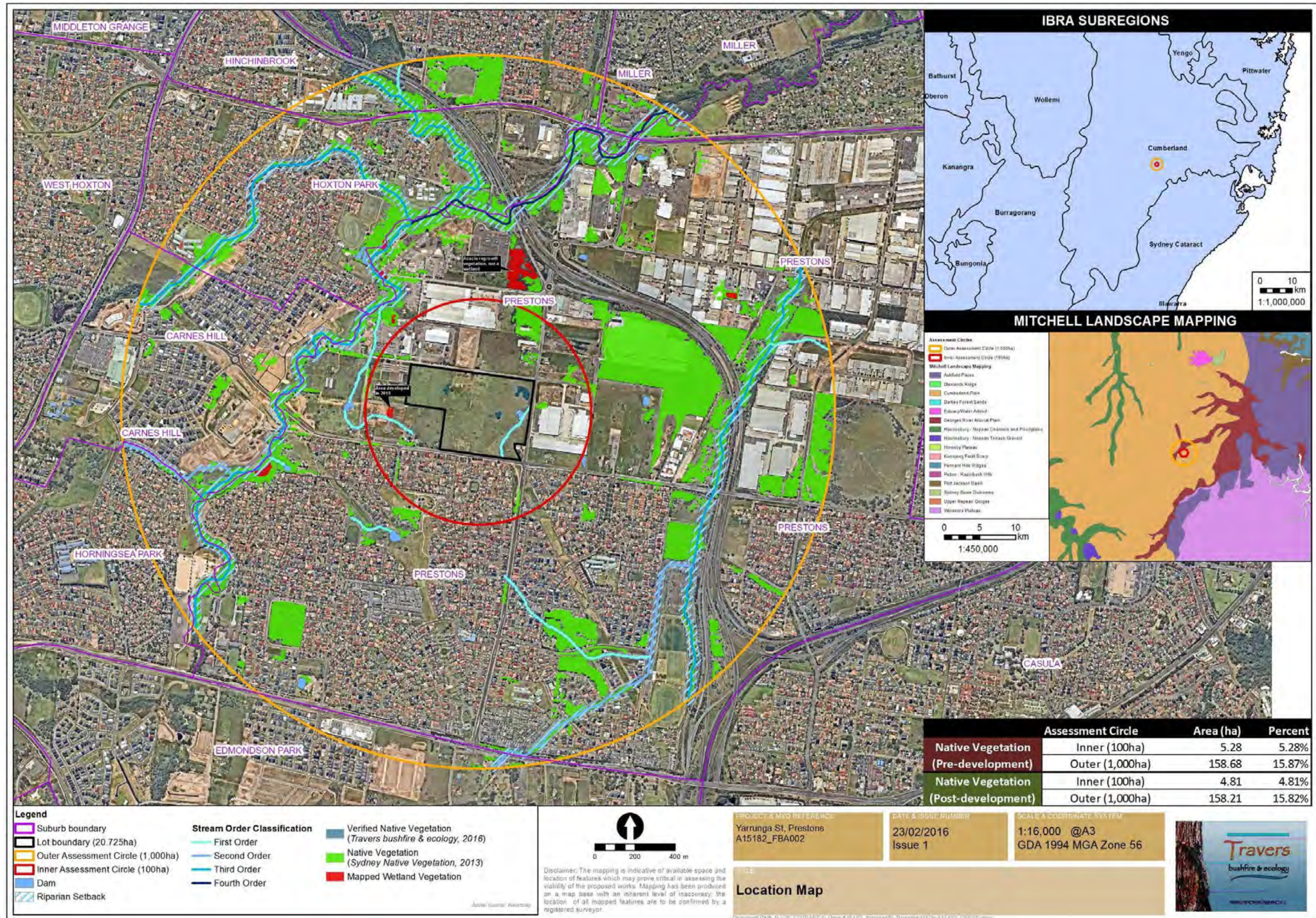


Figure 6 – Location map

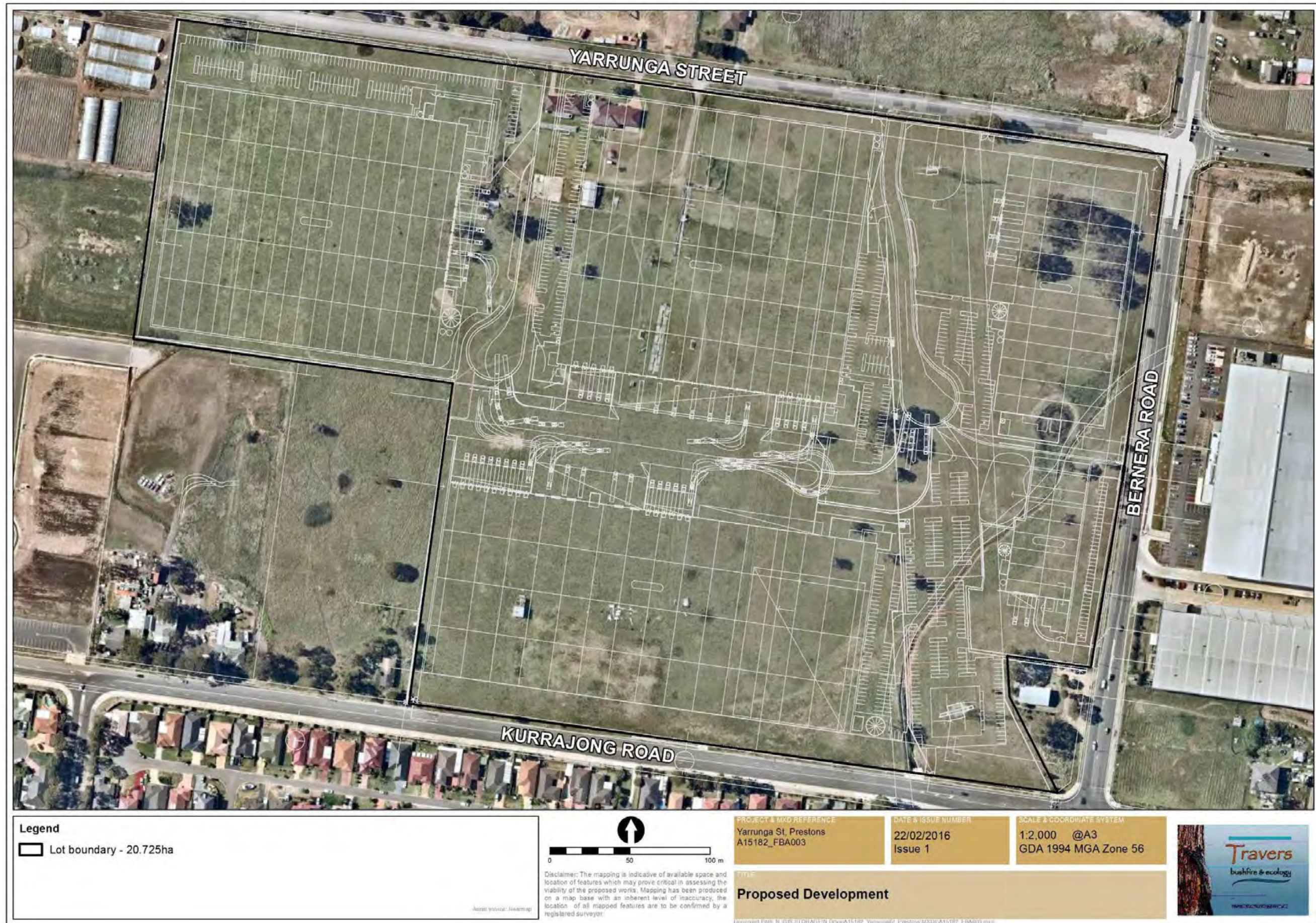


Figure 7 – Development site footprint



# Legislation and policies

## 2

### 2.1 Commonwealth

#### 2.1.1 *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's principal piece of environmental legislation and is administered by the Commonwealth Department of the Environment (DoE). It is designed to protect national environmental assets, known as Matters of National Environmental Significance (MNES), which include threatened species of flora and fauna, endangered ecological communities, migratory species as well as other protected matters. Among other things, it defines the categories of threat for threatened flora and fauna, identifies key threatening processes and provides for the preparation of recovery plans for threatened flora, fauna and communities.

Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES must be referred to the Commonwealth Minister for the Environment. No EPBC listed threatened flora or fauna species have been recorded within the development site. The remnant vegetation patches on site meet the criteria for recognition as a critically endangered ecological community under the TSC Act (Cumberland Plain Woodland), but does not meet the criteria under the EPBC Act.

A preliminary assessment of the MNES present within the development site indicated that there would not be a significant impact as a result of the project and, as such, no referral was required Biodiversity Assessment (*Travers bushfire and ecology 2015*).

#### 2.1.2 *Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*

Under the *Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, environmental offsets are actions taken to counterbalance significant residual impacts on MNES. Offsets are used as a last resort in instances where an action will give rise to residual impacts, even after the application of management measures.

The policy came into force in October 2012 and provides guidance on the role of offsets in environmental impact assessments and how DoE considers the suitability of a proposed offset package (SEWPac 2012). According to the policy, an offsets package is a "*suite of actions that a proponent undertakes in order to compensate for the residual significant impact of a project*" (SEWPac 2012). It can comprise a combination of direct offsets and other compensatory measures.

The project is not considered to result in a significant impact to MNES and, as such, no offsets will be required under the EPBC Act. The proposed restoration works counter any perceived loss of Cumberland Plain Woodland onsite, although it was not considered that remnant vegetation would be recognised as the EEC under this Act.

## **2.2 New South Wales**

### **2.2.1 Environmental Planning and Assessment Act 1979**

The EP&A Act is the overarching planning legislation in NSW that provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants. This includes threatened species, populations and ecological communities, and their habitats of biodiversity values, as listed in the NSW *Threatened Species Conservation Act 1995* (TSC Act) and NSW *Fisheries Management Act 1994* (FM Act). The protection of the environment is addressed in Section 5A of the EP&A Act - Significant effect on species, populations or ecological communities or their habitats.

The applicant is seeking SSD Consent under Division 4.1 of Part 4 of the EP&A Act. The Development Application submitted for the SSD must be accompanied by an EIS, which is to be prepared in accordance with the SEARs.

The SEARs for the project were issued by the NSW Department of Planning and Environment (DP&E) on 11 September 2015. The provisions that are relevant to this BAR are reproduced below.

The EIS for the development must meet the form and content requirements in Clause 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. The EIS must address the following specific matters that relate to flora and fauna:

- *All impacts on native vegetation on the site should be avoided wherever possible and, if not avoided, suitably offset. Potential impacts should be assessed in accordance with relevant Office of Environment and Heritage guidelines, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995.*

An assessment of the quantum and type of impacts resulting from the Project on biodiversity values and measures to avoid and mitigate these impacts is presented within this BAR.

### **2.2.2 Threatened Species Conservation Act 1995**

The TSC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities that are listed under the Act through threat abatement and species recovery programs. The TSC Act requires consideration of whether a development (Part 4) or an activity (Part 5) is likely to significantly impact threatened species, populations, communities or their habitat. The potential impacts of any developments, land use changes or activities do not need to undergo an "Assessment of Significance" under Section 5A of the EP&A Act as the Project has been declared a SSD. The impacts of the Project are therefore assessed within this Biodiversity Assessment Report in accordance with the FBA Methodology.

### **2.2.3 Fisheries Management Act 1994**

The FM Act provides for the protection, conservation and recovery of fish stocks, key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation as well as management of threats to threatened species, populations and ecological communities defined under the Act. In particular, the FM Act has mechanisms for the protection of fish, fish habitats, mangroves, seagrasses and seaweeds on public water land and foreshores. There is one (1) waterbody and one (1) discontinuous and intermittent

flowing first order stream within the eastern portion of the development site which is proposed to be piped and joining with existing stormwater infrastructure. The proposed development will not impact on any habitat of likely importance, fish stocks, key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation. The minor dam along the northern boundary did not contain any water at the time of inspection in November 2015.

#### **2.2.4 NSW Biodiversity Offsets Policy for Major Projects**

The *NSW Biodiversity Offsets Policy for Major Projects* was adopted in September 2014 and applies to SSD and State Significant Infrastructure designated under the EP&A Act. The policy provides a standard method for assessing impacts of major projects on biodiversity and determining offsetting requirements (OEH 2014b). The policy is underpinned by six (6) principles, which must be considered when assessing offsets for major projects.

The Framework for Biodiversity Assessment (FBA) has been developed in conjunction with the policy to provide a method for determining the quantum of impacts. The FBA provides rules and software for calculating the number and type of credits that a development site will require in order to offset its impacts and thus improve or maintain biodiversity values. "Credits" are the currency used within FBA and they are not specifically area measurements. Rather, they are a measure of the current quality of habitat. Where a proponent is proposing to establish an offset site as part of the BOS, the BioBanking Assessment Methodology (BBAM) must be used to assess the biodiversity values of the offset site and to identify the number and type of credits that may be created on the offset site (OEH 2014a).

The FBA requires the preparation of the following documents:

- Biodiversity Assessment Report: To describe the biodiversity values present within the Development Site and the impact of the Project on these values; and
- Biodiversity Offset Strategy: To outline how the proponent intends to offset the impacts of the Project.

These reports are required to be submitted as part of the EIS.

This proposal intends to offset the loss of biodiversity values through a combination of onsite revegetation works and purchasing of BioBanking credits from the open BioBanking market. The use of revegetation areas on site as biodiversity offsets are subject to the approval of the determining authority and NSW OEH.

As the FBA applies predominantly to terrestrial biodiversity, the NSW Offsets Policy for Major Projects and FBA refers to the NSW Department of Primary Industries Policy and Guidelines for Fish Habitat Conservation and Management (Update 2013) for guidance on assessing and offsetting aquatic impacts. Offsets for identified key fish habitats are required once avoidance and mitigation measures have been implemented. No key fish habitats have been identified within the site. A discontinuous and intermittent first order stream and small shallow dam (400 m<sup>2</sup>) are not considered as key fish habitat.



# Landscape features

## 3

### 3.1 Landscape features

For the purposes of this BAR, a 100 ha inner assessment circle and 1,000 ha outer assessment circle was established for identifying the landscape features associated with the project.

#### 3.1.1 IBRA bioregions and IBRA subregions

##### *i. Bioregions*

**Development site:** Sydney Basin Bioregion (100%)

**Outer assessment circle:** Sydney Basin Bioregion (100%)

The Development Site and outer assessment circle are wholly contained within the Sydney Basin Bioregion. This bioregion occupies approximately 3.6 million hectares (4.5% of NSW) and extends from just north of Batemans Bay to Nelson Bay, and almost as far west as Mudgee (NSW NPWS 2003). The Sydney Basin Bioregion is one of the most species diverse in Australia, which is the result of the variety of rock types, topography and climates in the bioregion (NSW NPWS 2003). This bioregion contains significant flora, fauna and wetlands.

The site in relation to IBRA bioregions is shown in Figure 8, and subregions in Figure 9.

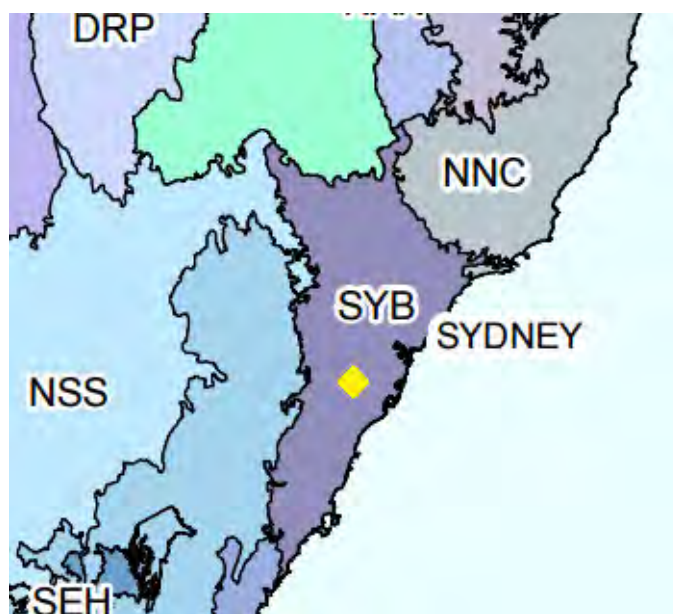
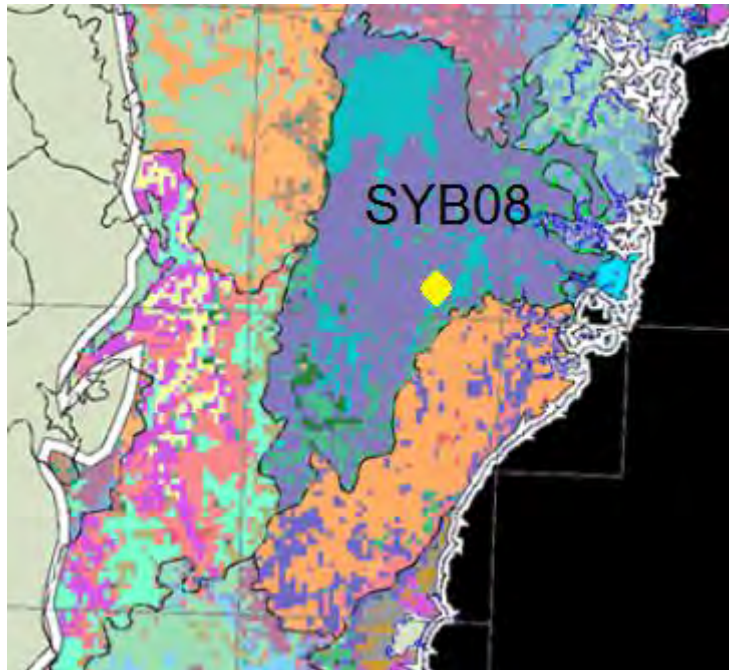


Figure 8 – IBRA bioregions



**Figure 9 – Approximate location of site within IBRA subregion SYB08**

*ii. Subregions*

**Development site:** Cumberland Subregion, SYB08 (100%)

**Outer assessment circle:** Cumberland Subregion (100%)

The development site and outer assessment circle are wholly contained within the Cumberland Subregion. This subregion is typified by low rolling hills and wide valleys in the rain shadow below the Blue Mountains (NSW NPWS 2003). The underlying geology of this subregion predominately comprises Triassic Wianamatta group shales and sandstones (NSW NPWS 2003). Vegetation communities of this subregion that occur in the vicinity of the development site include: Grey Box, Forest Red Gum, Narrow-leaved Ironbark woodland with some Spotted Gum on the shale hills; and Broad-leaved Apple, Cabbage Gum and Forest Red Gum with abundant Swamp Oak on river flats (NSW NPWS 2003).

**3.1.2 Mitchell Landscapes**

**Development site:** Cumberland Plain (100%)

**Outer assessment circle:** Cumberland Plain (77.56%) and Georges River Alluvial Plain (22.44%)

The development site is wholly contained within the Cumberland Plain Mitchell Landscape. This landscape is characterised by low rolling hills and valleys in a rain shadow area between the Blue Mountains and the coast on horizontal Triassic shales and lithic sandstones (DECC 2002). There are some occurrences of volcanic vents and is partly covered by Tertiary river gravels and sands with main streams containing quaternary alluvium. The general elevation of this Mitchell Landscape is between 30 and 120 m. Woodlands and open forest consist of *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus eugenioides* (Thin-leaved Stringybark), *Eucalyptus amplifolia* (Cabbage Gum) and *Angophora subvelutina* (Broad-leaved Apple) (DECC 2002). This vegetation has grassy to shrubby understorey often dominated by *Bursaria spinosa* (Australian Boxthorn), poorly

drained valley floors, often salt affected with *Casuarina glauca* (Swamp Oak) and *Melaleuca* sp. (DECC 2002).

The outer assessment circle also contains the Georges River Alluvial Plain Mitchell Landscape, which occurs within 100m of the north-western boundary of the development site. This Mitchell Landscape is characterised by channel, floodplain and terraces of the Georges River on Quaternary and Tertiary alluvial sediments. Mostly clayey sand and sand with limited gravel on the highest terrace, general elevation 0 to 30 m, local relief 10m. Massive uniform or gradational profiles on yellow brown to orange clayey sand. Podsoils with well-developed double pans on limited areas of deep quartz sand, stony, harsh, yellow, texture-contrast soils on higher terraces. Forest and woodland of cabbage gum (*Eucalyptus amplifolia*), rough-barked apple (*Angophora floribunda*), broad-leaved ironbark (*Eucalyptus fibrosa* ssp. *fibrosa*), scribbly gum (*Eucalyptus sclerophylla*) and narrow-leaved apple (*Angophora bakeri*). Extensive swamp oak (*Casuarina glauca*) along the riverbanks and in low-lying areas often with prickly-leaved tea-tree (*Leptospermum styphelioides*), these extend to brackish estuarine swamps with grey mangrove (*Avicennia marina*) and limited saltmarsh.

The extent of the Cumberland Plain Mitchell Landscape in relation to the development site and the outer assessment circle is shown in Figure 6.

### **3.1.3 Rivers and streams**

The development site and outer assessment circle occurs within the Sydney Metropolitan Catchment. One (1) discontinuous and intermittent first order stream, occurs in the south-east corner of the development site. It does not appear to have a connection to the nearby Cabramatta Creek and has been modified. It is likely that the drainage line is piped off site given the cut and fill that has been ongoing on adjoining industrial lots. The proposal will not retain the drainage line, instead piping it underground.

The nearby Cabramatta Creek is a larger tributary off the Georges River which begins at Chipping Norton Lake around Warwick Farm and Lansvale, and travels generally in a south-westerly direction to Leppington. It is the local catchment of the development site. The north-western corner of the development site is located 300 m from Cabramatta Creek.

### **3.1.4 Wetlands**

No important or local wetlands occur within the development site. There have been some vegetated areas within the outer assessment circle mapped as freshwater wetlands. One (1) of these wetlands is located 70m from the western boundary, but has been filled and was developed for a road in 2015. The second closest is 450m to the north, on the northern side of Yarrawa Street. Whilst it has not been ground-truthed, the aerial photograph shows it looking like a woodland, and the street view maps show it as a stand of Acacias, and is not a wetland.

Whilst small natural wetlands may occur within the 1000 ha outer circle, they would be small and none will be impacted directly or indirectly by the proposal.

There are no SEPP 14 wetlands located within the development site or outer assessment circle.

### **3.1.5 Native vegetation extent**

The outer assessment circle, which is 1,000 ha in size, occurs within an area in which a number of broad-scale vegetation mapping projects have been undertaken. To map the extent of native vegetation within the outer assessment circle, the 2013 Sydney Metropolitan

CMA vegetation mapping was overlain on a 2015 aerial available through NearMap. The extent of native vegetation cover was measured directly from the data available and utilised by ArcGIS. Any mapped vegetation in the dataset was removed for the development site and remapped using by ground-truthed vegetation mapping.

### 3.1.6 State or regionally significant biodiversity links

No state or regionally significant biodiversity links occur within the development site or outer assessment circle. Cumberland Plain Priority Conservation Lands have been mapped in the Sydney Basin Bioregion which aim to protect and to some extent, link significant patches of remnant vegetation. Priority Conservation Lands are identified within the approved Cumberland Plain Recovery Plan (DECCW 2011). The nearest Priority Conservation Lands are located 2.35 km to the south in Edmondson Park which is outside of the 1,000 ha assessment circle.

### 3.1.7 Other landscape features

No other landscape features within the Development Site or outer assessment circle were identified in the SEARs.

## 3.2 Landscape value score

### 3.2.1 Attributes

#### *i. Percent native vegetation cover*

A 100 ha inner assessment circle and 1,000 ha assessment circle were utilised for the project in accordance with the FBA methodology. The assessment circles were centred over the area of native vegetation that is most impacted by the project. There are patches of riparian vegetation to the north and west, and there are patches of remnant Cumberland Plain vegetation types more to the east. The placement of the centre of the 1,000 ha assessment circle is further centred upon the development site as it made little difference to any percent vegetation cover and score. The locations of the inner and outer assessment circles are shown on Figure 6.

The current and future percentage of native vegetation cover within the inner and outer assessment circles was determined in increments of 5% using GIS. Measurements that fall half way between the score value (Table 9 of the FBA methodology) such as been 11-15 and 16-20, were rounded up if 15.5 or down if 15.49.

**Table 3.1 - Current and future extent of native vegetation within the assessment circles**

Assessment circle	Current extent of native vegetation			Future extent of native vegetation		
	Area (ha)	% Cover	Score	Area (ha)	% Cover	Score
Inner assessment circle	5.28	5.28	≤5	4.81	4.81	≤5
Outer assessment circle	158.68	15.87	16-20	158.21	15.82	16-20

#### *ii. Connectivity value*

Native vegetation on the development site is part of a connecting link when it is linked to adjoining vegetation and native vegetation on the development site:

- if it is moderate to good condition, and
- has a patch size >1 ha, and

- is separated by a distance of <100m (or <30m for non-woody ecosystems), and
- is not separated by a large water body, dual carriageway, wider highway or similar hostile link.

The nearest link of vegetation is associated with a remnant 220m to the north of the site or to Cabramatta Creek some 300m away. As such there is no „link“. The future linkage value will not change or be altered. The score for connective value was given a 4 by the Biobanking credit calculator.

The development site is not part of a state significant biodiversity link or regionally significant biodiversity link such as a Priority Conservation Land in the Cumberland Plain Recovery Plan (2011).

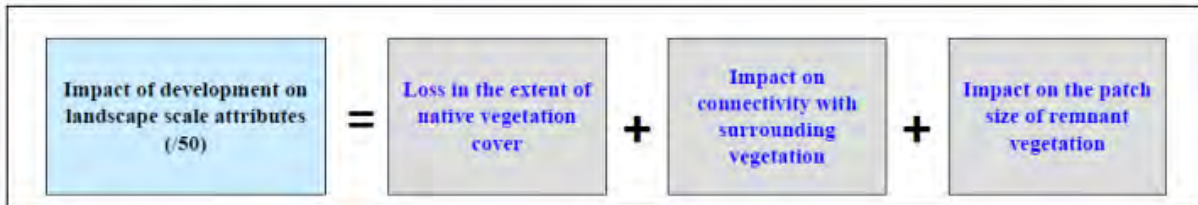
*iii. Patch size*

As the project is a site-based development, patch size has been determined in accordance with Appendix 4 of the FBA. The development site occurs within the Cumberland Plain Mitchell Landscape which has a cleared native vegetation value of 91%. The native vegetation within the development site is 0.48 ha. Of this vegetation, the largest patch of native vegetation, of which a portion occurs within the development site, is 0.31 ha. Based on the Cumberland Plain Mitchell Landscape, the patch size class of this vegetation is categorised as „small“ which has a corresponding patch size score of 1.

**3.2.2 Score**

Using the results from the assessment of landscape attributes and Equation 4 in Appendix 1 of the FBA, the landscape value score for the development site is 4+1 = 5.

**Summary of Equation 4: Calculate the change (loss) in landscape value with development**





# Native vegetation

# 4

## 4.1 Review of existing data

The following primary sources of information were consulted as part of a desktop assessment of the native vegetation within the development site:

- VIS Classification Database;
- Sydney Metropolitan Catchment Management Authority vegetation mapping (2013); and
- Ecological assessments undertaken by this firm for the site.

## 4.2 Field survey

A review of the Atlas of NSW Wildlife (OEH 2014) was undertaken prior to the site visit to determine threatened species previously recorded within 10km of the subject site.

An inspection of the site was made by a botanist on 16<sup>th</sup> December 2014. The habitat assessment results were utilised as part of a preliminary constraints assessment of the site.

On the 5<sup>th</sup> of November 2015, a full ecological survey was undertaken using a random meander, five (5) biometric quadrats (transect plot surveys) and target threatened species survey. Botanical survey included a random meander in accordance with *Cropper* (1993) to gain a full species list of the plants within the site, with exception to the landscaping plants around the existing dwellings. Five (5) 20x20m quadrats with a 50m transect (biometric style) were undertaken including three (3) within remnant bushland patches and two (2) within grazing parts of the site. Target searches for threatened species were included primarily within areas considered to provide the suitable habitat, those being amongst remnant patches of vegetation and along the site boundary. All observed plants are listed in Attachment 2. The location of the random meander, quadrats and vegetation communities are provided on Figure 5.

The following information was collected at each of the five (5) 20 x 20 m full floristic plots in accordance with Table 1 of the FBA:

- Stratum (and layer): stratum and layer in which each species occurs
- Growth form: growth form for each recorded species
- Species name: scientific name and common name
- Cover: a measure or estimate of the appropriate cover measure for each recorded species; recorded from 1–5% and then to the nearest 5%. If the cover of a species was less than 1% and the species was considered important, then the estimated cover was entered (e.g. 0.4)
- Abundance rating: a relative measure of the number of individuals or shoots of a species within the plot. The following intervals were used (numbers above about 20 are estimates only): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, or 1,000, or a number greater than 1,000 if required. This was undertaken for applicable species.

The following information was collected at each of the 20 x 50 m transect sites in accordance with Section 5.3.2 of the FBA:

- Native overstorey cover recorded at 10 points along a 50 m transect
- Native midstorey cover recorded at 10 points along a 50 m transect
- Native ground cover recorded at 50 points along a 50 m transect for three life forms (shrubs, grasses and other)
- Exotic plant cover expressed as a total percent cover across all strata (each strata measured using the same method for native overstorey, midstorey and ground cover)
- Number of trees with hollows visible from the ground within the 20 m x 50 m plot
- The total length of fallen logs >10 cm in diameter within the 20 m x 50 m plot
- The proportion of regenerating overstorey species within the vegetation zone

Stratification based on vegetation type and condition was taken into consideration when locating the plots and transects. Table 4.1 indicates that the minimum number of plot and transect sites required has been sampled for this assessment.

**Table 4.1 – Plot and transect survey effort**

PCT Zone	Condition	Area (Ha)	Minimum plot transect sites required	Minimum plot transect sites sampled
1	Moderate to good	0.31	1	1
2	Moderate to good_poor	0.17	1	2

### 4.3 Native vegetation extent within the development site

The development site is 20.725 ha in size, which includes 0.48 ha of native vegetation and 20.245 ha of cleared (or managed) land. The native vegetation extent within the development site is shown in Figure 5 and has been determined through aerial photograph interpretation and field surveys.

The native vegetation extent shown in Figure 5 includes one (1) native vegetation community type, spread over three (3) small patches, the total equating to 0.48 ha. The canopy consists of either *Eucalyptus tereticornis* or *Eucalyptus moluccana*, mostly the latter to a height of 17-22m. Within the three (3) patches, the mid-storey has been fully removed and suppressed through regular maintenance or grazing, with a singular *Melaleuca styphelioides* located in the western patch. The ground layer is heavily disturbed with very limited native species due to clearing, maintenance and grazing, and occupies less than 15% projected foliage cover.

The cleared and managed lands which occupy the remainder of the site are poor quality and heavily grazed. They do not fit the definition of a derived native grassland as the project foliage cover of native grasses and herbs generally do not exceed 5% and there is no regrowth of native shrubs or canopy species.

Five (5) transect plots were undertaken across the site. The five (5) following photographs demonstrate the condition at each of these.



*Photo 1 – Looking north north-west through transect plot 1*



*Photo 2 – Looking cross slope at the remnant vegetation around transect plot 2*



*Photo 3 – Looking east through the small remnant patch where transect plot 3 was undertaken*



*Photo 4 – Looking west north-west along transect plot 4*



*Photo 5 – Looking north-east along transect plot 5*

#### **4.4 Identification of plant community types**

Identification of the PCTs occurring within the development site was guided by the results of the review of surveys and transect plot data. The data collected during surveys of the development site was analysed in conjunction with a review of the PCTs held within the VIS Classification Database. Consideration was given to the following:

- Occurrence within the Cumberland IBRA subregion
- Vegetation formation
- Landscape position
- Dominant upper, mid and ground strata species

The analysis determined that the vegetation within the development site aligned with PCT 849 held within the VIS Classification Database.

##### ***Justification of choice***

**IBRA Subregion:** Occurs within the Cumberland IBRA subregion

**Vegetation formation:** Coastal Valley Grassy Woodlands

**Landscape position:** Occurs on clay/loam soils derived from Wianamatta Shales on the Cumberland Plain at low altitudes (mainly below 150m).

The full description of the PCT is shown as Table 4.2, taken directly from the VIS Classification Database. The PCT occurs within the Sydney Metropolitan CMA as ME020, as well as the Hunter-Nepean CMA as HN528.

**Table 4.2 – PCT 849 description**

<b>PlantCommunity Type ID</b>	849
<b>Biometric Vegetation Type ID List</b>	HN528; ME020;
<b>Common Community Name</b>	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
<b>Scientific Community Name</b>	Eucalyptus moluccana , Eucalyptus crebra , Eucalyptus eugenioides / Bursaria spinosa subsp. spinosa / Aristida vagans , Brunoniella australis , Cheilanthes sieberi subsp. sieberi , Desmodium gunnii
<b>Dominant Canopy Species</b>	Eucalyptus moluccana (Grey Box); Eucalyptus crebra (Narrow-leaved Ironbark); Eucalyptus eugenioides (Thin-leaved Stringybark);
<b>Main Associated Species</b>	Eucalyptus crebra (Narrow-leaved Ironbark); Eucalyptus eugenioides (Thin-leaved Stringybark);
<b>Landscape Position</b>	Occurs on clay/loam soils derived from Wianamatta Shales on the Cumberland Plain at low altitudes (mainly below 150m).
<b>Mid Stratum Species</b>	Bursaria spinosa subsp. spinosa (Native Blackthorn);
<b>Ground Stratum Species</b>	Eragrostis leptostachya (Paddock Lovegrass); Microlaena stipoides var. stipoides (Weeping Grass); Opercularia diphylla (Stinkweed); Paspalidium distans; Themeda australis (Kangaroo Grass); Wahlenbergia gracilis (Sprawling Bluebell); Lomandra filiformis (Wattle Matt-rush); Aristida vagans (Threeawn Speargrass); Brunoniella australis (Blue Trumpet); Cheilanthes sieberi subsp. sieberi (Rock Fern); Desmodium gunnii (Slender Tick-trefoil); Dichelachne micrantha (Shorthair Plumegrass); Dichondra repens (Kidney Weed);
<b>Other Diagnostic Features</b>	Woodland with an open shrub layer and a grassy groundcover.
<b>ProfileSource</b>	Tozer M. et al., 2006;
<b>Full Reference Details</b>	Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., 2006 Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0;
<b>Vegetation Formation</b>	Grassy Woodlands;
<b>Vegetation Class</b>	Coastal Valley Grassy Woodlands;
<b>Percent cleared</b>	ME020 - 95%; HN528 - 95%;
<b>Occurs As Original Vegetation Type</b>	No

Table 4.3 provides a summary of the PCT occurring within the development site, including vegetation formation, percent cleared within the Sydney Metropolitan catchment and extent within the development site.

**Table 4.3 – Summary of PCT occurring within the development site**

<b>PCT code</b>	<b>PCT name</b>	<b>Vegetation formation</b>	<b>Vegetation class</b>	<b>% Cleared within catchment</b>	<b>Area within development site (ha)</b>
ME020	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Grassy Woodlands	Coastal Valley Grassy Woodlands	95	0.48

The area of vegetation occurring along the drainage line and dam in the eastern portion of the development site does not conform to any approved PCT (including PCTs representing derived or secondary communities). Vegetation has established either opportunistically or has been planted. It does not conform to an endangered ecological community encompassing freshwater wetlands. The drainage line is almost entirely constructed and is piped offsite. The proposal seeks to remove the drainage line for future development and pipe it below ground. Photos 6, 7 and 8 show some of the vegetation within this area.

Figure 10 shows the PCT within the development site.



Figure 10 – PCT within the development site



*Photo 6 – The dam and fringing vegetation*



*Photo 7 – Relatively natural swale in the landscape with some opportunistic sedge species (mostly Carex and Juncus)*



Photo 8 – Constructed drainage off Kurrajong Road adjacent to the electrical easement

#### 4.4.1 Threatened ecological communities

PCT 849 identified within the development site is associated with a Threatened Ecological Community (TEC) according to the VIS Classification Database as shown in Table 4.4.

Table 4.4 – TECs associated with PCT occurring within the development site

PCT code	PCT name	TEC name	TEC status	Assessed or associated TEC?
ME020	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered	Yes

The vegetation condition for ME020 at the development site was assessed against the listing advice for Cumberland Plain Shale Woodland under the EPBC Act (Table 4.5). Due to the condition of ME020 within the development site, and threshold cutoff of 0.5 ha. The vegetation was determined as not conforming to Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest as listed under the EPBC Act.

**Table 4.5 – Evaluation of ME020 at the development site against EPBC Act listing advice thresholds**

Category and rationale	Threshold	Development site details
Core thresholds that apply under most circumstances: patches with an understorey dominated by natives and consistent with the minimum mapping unit size applied in NSW.	Minimum patch size is $\geq 0.5$ ha; AND $\geq 50\%$ of the perennial understorey vegetation cover is made up of native species	The total size of the patches equates to 0.48. There is significant separation to each and they do not extend on to adjoining lands. The largest patch size at the development site is 0.31 ha.  Less than 50% of the perennial understorey vegetation cover is made up of native species
OR  Larger patches which are inherently valuable due to their rarity.	The patch size is $\geq 5$ ha; AND $\geq 30\%$ of the perennial understorey vegetation cover is made up of native species.	The patch size at the development site is not $\geq 5$ ha.  Less than 30% of the perennial understorey vegetation cover is made up of native species.
OR  Patches with connectivity to other larger native vegetation remnants in the landscape.	The patch size is $\geq 0.5$ ha; AND $\geq 30\%$ of the perennial understorey vegetation cover is made up of native species; AND The patch is contiguous with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) that is $\geq 5$ ha in area.	The patch size at the development site is not $\geq 5$ ha.  Less than 30% of the perennial understorey vegetation cover is made up of native species.  The patch is not contiguous with a native vegetation remnant (any native vegetation where cover in each layer present is dominated by native species) that is $\geq 5$ ha in area.
OR  Patches that have large mature trees or trees with hollows (habitat) that are very scarce on the Cumberland Plain.	The patch size is $\geq 0.5$ ha in size; AND $\geq 30\%$ of the perennial understorey vegetation cover is made up of native species; AND The patch has at least one tree with hollows per hectare or at least one large tree ( $\geq 80$ cm dbh) per hectare from the upper tree layer species outlined in the Description and Appendix A (of the EPBC listing advice: Threatened Species Scientific Committee 2008)	The patch size at the development site is not $\geq 5$ ha.  Less than 30% of the perennial understorey vegetation cover is made up of native species.  The patch does have tree hollows and some with a DBH of 80cm or greater.

Figure 11 shows the TECs across the development site.



Figure 11 – TECs within the development site

#### 4.4.2 Description of PCTs within the development site

ME020: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin

ME020 occurs as three separate small patches across the development site. Each patch has no connective value and are isolated within existing paddocks.

The upper stratum is dominated by remnant and regrowth *Eucalyptus moluccana* (Grey Box) and/or *Eucalyptus tereticornis* (Forest Red Gum). A small tree layer (mid-storey) was present in one (1) patch consisting only of *Melaleuca styphelioides* (Prickly-leaved Tea Tree). There are no other mid-storey species with the exception of a little bit of mistletoe on some individual canopy specimens. The understorey is degraded by previous clearing, management and grazing, allowing for introduced pastures to flourish as well as non-native herbs.

Common exotic groundcover species were *Pennisetum clandestinum* (Kikuyu), *Paspalum dilatatum* (Paspalum), *Paspalum urvillei* (Vasey Grass), *Lolium perenne* (Perennial Ryegrass), *Axonopus fissifolius* (Narrow-leaved Carpet Grass), *Cynodon dactylon* (Common Couch), *Melinis repens* (Red Natal Grass), *Sida rhombifolia* (Paddy's Lucerne), *Cirsium vulgare* (Spear Thistle), *Verbena* spp., *Senecio madagascariensis* (Fireweed) and *Plantago lanceolata* (Ribwort).

Common native groundcover species were *Juncus remotiflorus*, *Microlaena stipoides* (Weeping Grass), *Austrodanthonia tenuior* (Wallaby Grass), *Dichelachne micrantha* (Short-hair Plume Grass), *Einadia nutans* subsp. *linifolia*, *Einadia polygonoides*, *Glycine clandestine* (Twining Glycine), *Brunoniella australis* (Blue Trumpet) and *Themeda australis* (Kangaroo Grass). Native ground covers generally occupy less than 10% projected foliage cover.

The remaining vegetation on site does not conform to any listed PCT.

### 4.5 Vegetation zones

The PCT occurring within the development site was stratified into areas by condition. ME020 was separated into two vegetation zones, on the basis of the understorey condition and regeneration capacity. ME020 was assessed as being within one broad condition state, moderate – good, given the overstorey was within threshold limits or did not meet the criteria to be classed as low condition.

A summary of the vegetation zones within the development site is provided in Table 4.5 and their distribution is shown in Figure 12.

Each vegetation zone was assessed using plot transect surveys to determine the site value score. Summary plot transect data collected from the vegetation zones are provided in Appendix A. The calculated site value score for each of the vegetation zones identified within the development site is shown in Table 4.6.

All of the vegetation zones within the development site have a site value score of  $\geq 17$  and therefore must be further assessed.

**Table 4.6 – Vegetation zones within the development site**

<b>Zone</b>	<b>PCT</b>	<b>Condition class</b>	<b>Area (ha)</b>	<b>Site value score</b>
1	ME020: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Moderate to good - medium	0.31	39.76
2	ME020: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Moderate to good - poor	0.17	34.72

## **4.6 Groundwater dependent ecosystems**

Groundwater dependent ecosystems (GDEs) were initially assessed by reviewing the Groundwater Dependent Ecosystem Atlas (BOM 2015) for the site.

No GDE was identified within the development site.



Figure 12 – Vegetation zones in the development site



# Threatened species and populations

## 5

### 5.1 Review of existing data

The following primary sources of information were consulted as part of a desktop assessment of potentially occurring threatened species and populations within the development site:

- Biodiversity Assessment undertaken by *Travers Bushfire and Ecology*, 2015;
- OEH Atlas of NSW Wildlife (OEH 2015); and
- Threatened Species Profile Database.

Information obtained during the review of existing data was utilised in determining candidate ecosystem credits species and species credit species.

### 5.2 Field survey

#### 5.2.1 Habitat assessment

A general landscape habitat assessment was undertaken within the development site by *Travers bushfire and ecology* on the 5<sup>th</sup> of November, 2015. Fauna habitat assessments included consideration of habitat condition and complexity including the occurrence of microhabitats such as tree hollows and fallen logs, as well as the drainage line utilisation by frog species. Hollows were used as a general indication of habitat quality for arboreal fauna, and hollow dwelling birds and bats.

#### 5.2.2 Targeted threatened species surveys

##### *i. Flora*

A review of the OEH Atlas of NSW Wildlife (OEH 2015 - November) was undertaken prior to the botanical survey to identify threatened species previously recorded within 10km of the development site and identify the targeted species searches that were required.

*Travers bushfire and ecology* undertook random meander searches on the 5<sup>th</sup> of November 2015 to identify flora occurring on site and develop a broad species list.

Target searches for threatened species were undertaken for those considered relevant during the random meander and stratified (transect plot) surveys.

Targeted surveys were conducted within areas of suitable habitat for each threatened flora species assessed as a candidate species credit species (for list of candidate species credit species, see Section 5.5).

The location of the transect plots is shown on Figure 13. Target species survey locations are shown on Figure 14.



Figure 13 – Plot transect locations in the development site



Figure 14 – Target species survey within the development site

## ii. Fauna

Diurnal fauna survey was undertaken on the 5<sup>th</sup> of November 2015 and included snail and reptile habitat searches in the woodland remnants, bird activity and call survey and habitat tree survey. Nocturnal fauna survey included spotlighting, frog call identification, Anabat recording (x2 passive recording stations) and nocturnal call-playback. Call-playback targeted Australasian Bittern near the eastern dam as well as Barking Owl and Masked Owl.

Anabat survey was terminated early in the evening due to heavy rain at this time.

A summary of the survey effort is shown in Table 5.1.

**Table 5.1 – Fauna survey effort**

Fauna group	Date	Weather conditions	Survey technique(s)	Survey effort / time (24hr)
Diurnal birds	5/11/15	8/8 cloud, mod E wind, temp 22°C	Diurnal opportunistic	3hrs 1615 - 1915
Nocturnal birds	5/11/15	8/8 cloud, light SE wind, rain after dark, temp 18°C	Spotlighting	1hr 10min 1930 - 2040
Arboreal mammals	5/11/15	8/8 cloud, light SE wind, rain after dark, temp 18°C	Spotlighting	1hr 10min 1930 - 2040
			Call playback (Masked/Barking Owl & Australasian Bittern)	Commenced @ 1930
Terrestrial mammals	5/11/15	8/8 cloud, light SE wind, rain after dark, temp 18°C	Spotlighting	1hr 10min 1930 - 2040
Bats	5/11/15	8/8 cloud, light SE wind, rain after dark, temp 18°C	Spotlighting	1hr 10min 1930 - 2040
			Anabat (Passive/mobile monitoring)	45min 1945 - 2030
			Anabat (Passive monitoring)	1hr 10min 1930 - 2040
Reptiles	5/11/15	8/8 cloud, mod E wind, temp 22°C	Diurnal opportunistic / habitat searches	3hrs 1615 - 1915
Amphibians	5/11/15	8/8 cloud, light SE wind, rain after dark, temp 18°C	Spotlighting & call identification	1hr 10min 1930 - 2040

### a. Green and Golden Bell Frog and other amphibian surveys

*Travers bushfire and ecology* conducted targeted Green and Golden Bell Frog surveys that involved diurnal habitat searches, listening for calling males after dark, spotlighting and call-playback techniques. An assessment of potential habitat for threatened frog species on the site was also carried out primarily along the drainage line and dam area near the eastern boundary of the development site.

Breeding call imitation and sound stimulation was used in each of the potential habitat areas of the Green and Golden Bell Frog to try to evoke calling by sheltering frogs. A listening period followed each calling session.

It is noted that the breeding season for the species generally lies between September to December. Surveys were undertaken during this period.

### b. Cumberland Plain Land Snail surveys

Habitat searches were undertaken by *Travers bushfire and ecology* within the Cumberland Plain Woodland area in the north-east corner of the development site. Areas of dense leaf litter

with likely moisture retaining properties were scraped using a three pronged rake. Logs were also turned over.

#### c. Bird and owl surveys

Visual observation and call identification of diurnal birds was carried out by *Travers bushfire and ecology* during survey within the development site. Diurnal birds were identified and recorded as they were encountered throughout the development site. Spotlighting and call playback techniques were deployed for the threatened owl species and Australasian Bittern.

#### d. Microchiropteran bat surveys

Ultrasonic call detection surveys for microchiropteran bats were undertaken at two (2) locations within the development site. Anabat units were positioned in suitable habitat on the edge of two (2) remnant bits of vegetation. The Anabat units were set up and activated before dusk and continued after dark. Ultrasonic calls collected from the Anabat were then analysed.

#### e. Incidental observations

Any incidental vertebrate fauna species that was observed, heard calling, or otherwise detected on the basis of tracks or signs were recorded and listed in the total species list for the development site.

### **5.2.3 Survey limitations**

The development site is highly disturbed by past activities, ongoing management and grazing. The development site supports very poor fauna habitat as remnant patches are very small and isolated.

Seasonal survey is often a requirement where reasonable quality bushland and habitat exists, in particular for flora species which are near to impossible to detect unless in flower, and during breeding times for particular fauna groups.

*Travers bushfire & ecology* considers that the surveys undertaken are appropriate for this site to obtain a good understanding of the threatened flora and fauna that are likely to utilise the habitats within the development site.

## **5.3 Fauna habitats within the development site**

The majority of the development site is highly disturbed by past activities, including clearing, management (under-scrubbing and mowing), and grazing. As a result most of the habitat available to native species is degraded and has low suitability. Habitats are quite isolated also from any surrounding native vegetation.

### **5.3.1 Woodland habitat**

Woodland habitat occurs in three (3) small patches within the development site, totalling 0.48 ha. There are a few paddock trees also, but the understorey contains only a few percent of native grasses and herbs. Some trees on site were found to be hollow-bearing which may or may not provide variable roosting habitat for various terrestrial fauna. Hollow-bearing tree details are provided in Table 5.2. The locations of each habitat tree are provided on Figure 5.

**Table 5.2 – Hollow-bearing tree data**

Tag no.	Common name	DBH (cm)	Spread (m)	Height (m)	Vigour (%)	Hollows recorded
HT1	Grey Box	80	15	18	70	2x 5-10cm branch ends
HT2	Grey Box	90	15	20	80	1x 5-10cm branch
HT3	Grey Box	60	10	16	0	2x 10-15cm trunk
HT4	Stag	100	6	12	0	5x 0-5cm, 5x 5-10cm, 4x 10-15cm starlings nesting
HT5	Grey Box	100	9	16	0	1x 30-40cm trunk

Target searches for the Cumberland Plain Land Snail were undertaken in the larger remnant of Cumberland Plain Woodland vegetation in the north-east corner of the development site. Leaf litter was marginal and there was very little in situ quality habitat present. The patch is also very isolated and small, therefore the habitat was considered to be sub-optimal.

### **5.3.2 Aquatic habitat**

There is a small depression along the northern boundary of the development site containing *Juncus*. At the time of survey in November 2015, there was no water present. The drainage line and dam near the eastern boundary of the development site contained some water and macrophytes. It is apparent that the existing drainage and dam been largely modified and graded. It was considered that there may be some level of suitable habitat for the Green and Golden Bell Frog, although unlikely due to small size and isolation.

## **5.4 Ecosystem credit species**

### **5.4.1 Predicted ecosystem credit species**

The credit calculator generates a list of predicted ecosystem credit species utilising a number of variables. Table 5.3 lists the predicted ecosystem credit species for the development site, which has been based on the following:

- IBRA subregion: Cumberland;
- Associated PCT: ME020;
- Percent native vegetation in outer assessment circle: 16-20%;
- Condition of vegetation: moderate to good (all vegetation zones);
- Patch size: >0.31 ha; and
- Credit type: Ecosystem.

**Table 5.3 – Predicted ecosystem credit species**

**Survey time matrix**

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dillwynia tenuifolia	<i>Dillwynia tenuifolia</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Downy Wattle	<i>Acacia pubescens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Pygmy-possum	<i>Cercartetus nanus</i>												
Green and Golden Bell Frog	<i>Litoria aurea</i>	Yes	Yes	Yes					Yes	Yes	Yes	Yes	Yes
Hypsela sessiliflora	<i>Hypsela sessiliflora</i>									Yes	Yes	Yes	
Koala	<i>Phascolarctos cinereus</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regent Honeyeater	<i>Anthochaera phrygia</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spiked Rice-flower	<i>Pimelea spicata</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Squirrel Glider	<i>Petaurus norfolcensis</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sydney Plains Greenhood	<i>Pterostylis saxicola</i>									Yes	Yes	Yes	
Thick Lip Spider Orchid	<i>Caladenia tessellata</i>									Yes	Yes		
White-flowered Wax Plant	<i>Cynanchum elegans</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Predicted threatened species**

Common name	Scientific name *	TS offset multiplier	On site *	
Diamond Firetail	<i>Stagonopleura guttata</i>	1.3	No	Edit
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	2.2	Yes	Edit
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	2.0	No	Edit
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	2.2	Yes	Edit
Little Eagle	<i>Hieraetus morphnoides</i>	1.4	No	Edit
Little Lorikeet	<i>Glossopsitta pusilla</i>	1.8	No	Edit
Painted Honeyeater	<i>Grantiella picta</i>	1.3	No	Edit
Spotted Harrier	<i>Circus assimilis</i>	1.4	No	Edit
Swift Parrot	<i>Lathamus discolor</i>	1.3	No	Edit
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	2.2	No	Edit

## 5.5 Species credit species

### 5.5.1 Candidate species credit species

The credit calculator generates a list of candidate species credit species utilising a number of variables including classification of the species as a species credit species, the distribution of the species within the same IBRA subregion as the development site and the presence of habitat features or components associated with the species.

The habitat features that have been assessed as present within the development site are as follows:

**Table 5.4 – Assessment of specific geographic / habitat features**

Impact?	Common name	Scientific name	Feature
<input checked="" type="checkbox"/>	Cumberland Plain Land Snail	Meridolum comeovirens	land containing bark or leaf litter accumulation
<input type="checkbox"/>	Large-eared Pied Bat	Chalinolobus dwyeri	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels
<input type="checkbox"/>	Matted Bush-pea	Pultenaea pedunculata	land within 5 km of coast in South East Coastal Plains CMA subregion
<input checked="" type="checkbox"/>	Green and Golden Bell Frog	Litoria aurea	land within 100 m of emergent aquatic or riparian vegetation
<input checked="" type="checkbox"/>	Hypsela sessiliflora	Hypsela sessiliflora	Wet and damp areas only.

Threatened flora and fauna species that have been generated within the credit calculator as candidate species for this assessment are listed in Table 5.3.

### 5.5.2 Candidate species for further assessment

Table 5.5 lists the candidate species credits generated within the credit calculator and an assessment of their potential presence within the development site based on habitat components. The following threatened flora and fauna species have been considered as potentially occurring and are required to be further assessed:

**Table 5.5 – Species for consideration from the credit calculator tool**

Common name	Scientific name *	Impacted by development?	Id method	Loss	UOM	Survey date	TS offset multiplier value
Cumberland Plain Land Snail	Meridolum comeovirens	No	Survey	0.00	ha	05/11/2015	1.3
Dillwynia tenuifolia	Dillwynia tenuifolia	No	Survey	0.00	indiv	05/11/2015	1.8
Downy Wattle	Acacia pubescens	No	Survey	0.00	indiv	05/11/2015	1.9
Eastern Freetail-bat	Mormopterus norfolkensis	Yes	Survey	0.48	ha	05/11/2015	2.2
Eastern Pygmy-possum	Cercartetus nanus	No	Survey	0.00	ha	05/11/2015	2.0
Greater Broad-nosed Bat	Scoteanax rueppellii	Yes	Survey	0.48	ha	05/11/2015	2.2
Green and Golden Bell Frog	Litoria aurea	No	Survey	0.00	ha	05/11/2015	2.6
Hypsela sessiliflora	Hypsela sessiliflora	No	Survey	0.00	indiv	05/11/2015	7.7
Koala	Phascolarctos cinereus	No	Survey	0.00	ha	05/11/2015	2.6
Regent Honeyeater	Anthochaera phrygia	No	Survey	0.00	ha	05/11/2015	7.7
Spiked Rice-flower	Pimelea spicata	No	Survey	0.00	indiv	05/11/2015	2.6
Squirrel Glider	Petaurus norfolcensis	No	Survey	0.00	ha	05/11/2015	2.2
Sydney Plains Greenhood	Pterostylis saxicola	No	Survey	0.00	indiv	05/11/2015	4.0
Thick Lip Spider Orchid	Caladenia tessellata	No	Survey	0.00	indiv	05/11/2015	1.3
White-flowered Wax Plant	Cynanchum elegans	No	Survey	0.00	indiv	05/11/2015	1.4

**Table 5.6 – Assessment of potential presence of species credit species**

Scientific name	Common name	Required habitat components	Assessment of habitat within the development site	Requires further assessment?
<b>Flora</b>				
<i>Acacia pubescens</i>	Downy Wattle	Occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale / Gravel Transition Forest and Cumberland Plain Woodland.	Potential to occur. Cumberland Plain Woodland is present within the development site. 91 records of the species within a 10 km radius of the development site.	Yes
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	Terrestrial orchid. Clay-loam or sandy soils. LHCCREMS guidelines suggest the species grows in Map Unit 34 – Coastal Sand Wallum Woodland - Heath. Flowers in September – November. Distribution limits N-Swansea S-south of Eden. Is known to favour low, dry sclerophyll woodland (for example open Kunzea woodland) with a heathy or sometimes grassy understorey.	No suitability for occurrence within the development site. No records exist within a 10km radius of the development site.	No
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree– Coastal Banksia coastal scrub; Forest Red Gum aligned open forest and woodland; Spotted Gum aligned open forest and woodland; and Bracelet Honey Myrtle scrub to open scrub.	Woodland containing Forest Red Gum is present although it is noted that there are only 2 records within a 10km radius of the development site, approximate 6km away. Both records are from the 1990s. It is considered the habitat present is too poor to support the species given there is generally no mid-storey.	No
<i>Dillwynia tenuifolia</i>		May be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional	All local specimens are 4km or more from the development site, mostly located around Kemps Creek which forms an endangered population of the species. There are no laterised clays present, nor tertiary alluvium.	No

Scientific name	Common name	Required habitat components	Assessment of habitat within the development site	Requires further assessment?
		areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	The vegetation association is generally absent as well.	
<i>Hypsela sessiliflora</i>	Hypsela sessiliflora	Known to grow in damp places, on the Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland ecotone.	Unlikely in consideration of the poor quality understorey vegetation in or adjacent to the drainage line and dam in the eastern portion of the development site.	No
<i>Pimelea spicata</i>	Spiked Rice-flower	On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark.	Potential to occur. A grey box community is present on the site. 32 records of the species within a 10 km radius of the development site.	Yes
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Typically in shallow /skeletal soils on rock shelves and platforms. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	Unlikely to occur. Site does not contain rock platforms, or associated skeletal soils. No recent records of the species within a 10 km radius of the development site.	No
<b>Fauna</b>				
<i>Anthochaera phrygia</i>	Regent Honeyeater	The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: <i>Eucalyptus microcarpa</i> , <i>E. punctata</i> , <i>E. polyanthemos</i> , <i>E. moluccana</i> , <i>Corymbia robusta</i> , <i>E. crebra</i> , <i>E. caleyi</i> , <i>C. maculata</i> , <i>E. mckieana</i> , <i>E. macrorhyncha</i> , <i>E. laevopinea</i> , and <i>Angophora floribunda</i> . Nectar and fruit from the mistletoes <i>Amyema miquelii</i> , <i>A. pendula</i> and <i>A. cambagei</i> are also eaten during the breeding season.	Potential to occur but unlikely. Occurrences of <i>E. tereticornis</i> may provide habitat for this species. No recent records of the species within a 10 km radius of the development site and only 3 in total.	Yes

Scientific name	Common name	Required habitat components	Assessment of habitat within the development site	Requires further assessment?
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Associated PCTs with an understorey containing heath, banksias or myrtaceous shrubs including <i>Leptospermum</i> spp. Trees with hollows >2cm, loose bark of eucalypts or accumulations of shredded bark in tree forks for nesting. As per breeding and abandoned bird-nests, Ringtail Possum ( <i>Pseudocheirus peregrinus</i> ) dreys or thickets of vegetation, (e.g. grass-tree skirts) for shelter.	Unlikely to occur. No suitable habitat in the form of heath, banksias or myrtaceous shrubs. No records of the species within a 10 km radius of the development site.	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	Amongst emergent aquatic or riparian vegetation and amongst vegetation, fallen timber adjacent to and within 500m of breeding habitat, including grassland, cropland and modified pastures. Still or slow-flowing natural water bodies with some aquatic emergent vegetation such as <i>Typha</i> spp. or <i>Eleocharis</i> spp. Will use artificial water bodies and non-native emergent vegetation. Vegetation, rocks and fallen timber, leaf litter, manmade ground cover, debris and in soil cracks up to 1km from breeding habitat.	The suitability of the drainage line and dam are was considered low. It is an isolated piece of habitat and very small. There is only 1 record within a 10km radius of the development site, and that record is from the 1960s. It is quite probable that the species not longer occurs in the area, thus the likelihood of occurrence within the development site is unlikely also.	Yes
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	Bark or leaf litter accumulation. Primarily inhabits Cumberland Plain Woodland, and also known from Shale Gravel Transition Forests, Castlereagh Swamp Woodlands and the margins of River-flat Eucalypt Forest.	Potential habitat is limited to the larger 0.31 ha patch only. This remnant is very isolated and contains very little leaf litter and on-ground refuse. The likelihood for potential is considered low. No specimens were observed during surveys.	Yes
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. <i>Distribution Limit: N-Woodenbong. S-Pambula.</i>	Possible recording on Anabat. Many local records are present and some very recent. For the credit calculator it is assumed as present.	Yes

Scientific name	Common name	Required habitat components	Assessment of habitat within the development site	Requires further assessment?
<i>Petaurus norfolcensis</i>	Squirrel Glider	Associated PCTs with mature, mix-age eucalypts with flowering shrubs and wattles in the understorey. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt- Bloodwood forest with heath understorey in coastal areas. Tree hollows >5 cm diameter in eucalypt forests and woodlands.	Unlikely to occur. Vegetation occurring within the development site is not suitable for the species. Suitable hollows would be present on site, but remnants are so small and isolated from other vegetation patches. Only 1 record of the species occurs within a 10 km radius of the development site.	No
<i>Phascolarctos cinereus</i>	Koala	As per Koala Food Tree Species listed in Appendix 2 of the NSW State Koala Recovery Plan.	Unlikely to occur. Although one primary feed tree occurs within the development site ( <i>Eucalyptus tereticornis</i> ), the habitat is significantly fragmented from any nearby connecting habitat. There are no 29 records of the species within a 10 km radius of the development site.	No
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Inhabits areas containing moist river and creek systems, especially tree lined creeks. <i>Distribution Limit: N-Border Ranges National Park. S-Pambula.</i>	There are 21 records within a 10 km radius of the development site. There was a potential recording of the species by an Anabat and it is assumed as being present for the credit calculator	Yes

### 5.5.3 Presence of candidate species

Table 5.7 outlines the surveys that were undertaken for each of the candidate species that were assessed as requiring further assessment.

Surveys for each of these species were undertaken at an appropriate time of year and weather conditions.

Anabat survey has recorded a bat species which was not identifiable to a high degree of certainty. It is probable that the recording could have been Eastern Freetail-bat or Greater Broad-nosed Bat. Both species do occur locally and have been recorded within the last 10 years. For the purposes of using the credit calculator, both have been assumed to be present.

A list of flora and fauna species recorded during surveys is provided in Appendix B and Appendix C, respectively.

**Table 5.7 – Summary of surveys undertaken for candidate species credit species**

Scientific name	Common name	Survey type	Survey timing
<i>Acacia pubescens</i>	<i>Acacia pubescens</i>	Random meanders in woodland and target searches during transect plot data collection	5 November 2015
Downy Wattle	Downy Wattle	Random meanders in woodland and target searches during transect plot data collection	5 November 2015
<i>Anthochaera phrygia</i>	<i>Anthochaera phrygia</i>	Diurnal bird survey	5 November 2015
<i>Litoria aurea</i>	<i>Litoria aurea</i>	Habitat searches and nocturnal survey	5 November 2015
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	Targeted searches in woodland areas with leaf litter and on-ground refugia	5 November 2015
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	Anabat	5 November 2015
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Anabat	5 November 2015

Figure 14 shows specific search areas / types and the location where there was any occurrences of the species.



# Avoid and minimise impacts

## 6

This chapter outlines the extent of proposed actions to avoid the potential direct and indirect impacts of the project on biodiversity values. It also summarises proposals to minimise the potential direct and indirect impacts to biodiversity values by implementing mitigation measures.

### 6.1 Avoidance measures

The proposed final project footprint for development is shown in Figure 7 and this demonstrates that the proposed project has been located upon a site that has been extensively cleared and modified. Any native vegetation remaining occupies just 2.3% of the total site area, and they are very isolated from any other patch of native vegetation.

The development site is located in an area that has been historically cleared and the vegetation on site consists of very small Cumberland Plain Woodland (CPW) remnants of a small size. The conservation of these patches does not appear reasonable to conserve and the proposed development will result in an increased area of CPW through a linear corridor on the southern boundary. This is a good outcome within the site and wholly supportable as a concept for this site. Other areas along the northern and eastern boundary will be landscaped also, but not to a fully structured CPW community.

An existing but discontinuous watercourse is found within the eastern portion of the development site but it is now essentially a stormwater drain of low ecological and catchment value. There does not seem to be a justification for its retention along with the existing vegetation and is proposed to be removed and piped into the existing stormwater.

The proposed development site will not result in clearing or other losses of vegetated corridors on the land. The direct ecological impacts of the proposal will be to remove small patches of relatively isolated and degraded vegetation, as assessed in Chapter 7.

There is limited to no potential for any other indirect impacts to vegetation due to the lack of any surrounding vegetated habits adjoining site. A few native trees are found on adjoining properties but are not expected to be impacted. Indirect impacts are primarily associated with construction works impacting surrounding land uses such as:

- Sedimentation and run off
- Noise, dust and light spill
- Impacts to adjoining vegetation and habitat
- Introduction of feral pests, weeds and pathogens
- Infrequent or cumulative impacts
- Operations phase impacts (trampling of vegetation, rubbish dumping, noise, etc)

The project will include measures designed to minimise the impacts on retained vegetation as set out in Section 6.2.

## 6.2 Mitigation measures

The following mitigation measures are proposed to minimise the potential ecological impacts, address threatening processes and to create a positive ecological outcome fauna, their habitat and endangered ecological communities. They include:

Pre-construction phase:

- Inspection and relocation of any wildlife in existing habitat trees under the supervision of a fauna ecologist.
- Sediment and erosion control measures are to be installed immediately prior to the commencement of demolition, construction and earthworks.
- Inspection and removal of any aquatic fauna from the existing dam and vegetation.
- Installation of protective fencing around drip zone of trees that interface with the development site.

Construction phase:

- Sediments are to be effectively retained within the site to minimise deterioration of surface runoff during the construction works.
- Unnamed watercourse (watercourse 1) – first order stream.
  - Declassify as a watercourse to drainage line;
  - Establish sediment basins to collect any sediment mobilised from the site. Remove fill, stabilise and revegetate with wetland and CPW species; and
  - Stabilisation of proposed revegetation areas.

Post construction phase:

- Loss of vegetation compensated by the planting of CPW vegetation along the southern boundary of the site as shown in the Landscape plan (Figure 2). Revegetation will enhance replace lost foraging trees for birds and bats. A 0.92 ha revegetation area is proposed to compensate for the loss of habitat and existing vegetation caused by the proposal. The includes 0.64 ha of CPW planting along Kurrajong Road, 0.10 ha of CPW planting in the Aboriginal heritage area, 0.18 ha of partly structured CPW under the electrical easement along Kurrajong Road and the remainder along Yarrunga Street and Bernera Road to be landscaped with trees.
- Aim to filter any runoff through sedge planted filters to minimise deposition within stormwater systems.
- Target weed control should be undertaken in revegetation areas, focussing upon invasive and noxious weed species.

## 6.3 Impacts that cannot be avoided or mitigated

A summary of the direct impacts and how they will be addressed is provided in Table 6.1. These impacts have been assessed using the credit calculator and are discussed in Chapter 7.

The scale and extent of the indirect impacts are summarised in Table 6.2.

**Table 6.1 – Summary of direct impacts**

Impact	How it is addressed	Outcome	Timing	Responsibility
Clearing of 0.48ha native vegetation	<p>Whilst the retention of the native vegetation has not been avoided, the proponents are revegetating within the site as a vegetation screen to surrounding development. This will be in the form of three revegetation areas as follows:</p> <ul style="list-style-type: none"> <li>• Prestons Creek bank Aboriginal Area = 970 m<sup>2</sup> of CPW</li> <li>• Kurrajong Road Setback = 6,428 m<sup>2</sup> of CPW</li> <li>• 1,834 m<sup>2</sup> of tree plantings along Yarrunga Street and Bernera Road.</li> </ul> <p>The revegetation areas will be secured by Covenant and managed in accordance with an approved vegetation management plan in perpetuity.</p>	Loss of native vegetation will be offset by 0.9232 ha of revegetation within the site and by acquiring and retiring offset credits from the open biobank market.	<p>Sourcing of credits will be commenced once approval is obtained.</p> <p>Retirement of credits will occur according to FBA rules.</p>	Property owner
Loss of ecological stepping stone	The existing remnants will be replaced by three remnants within the site as revegetation areas. The revegetation areas will be secured by a covenant and managed in accordance with an approved vegetation management plan in perpetuity.	No major or minor connecting link will be disrupted by the proposed development. The slight reduction of the one "stepping stone" link, which runs through the development site, is accounted for in the calculations under the FBA. The purchase of biodiversity credits includes a "punishment" for this direct impact.	Same as above	Property owner
Loss of fauna habitat	There will be a loss of some minor habitat within the site. The revegetated habitat however will be replaced by artificial „naturalised" habitat structures, reused hollows and artificial hollows suited to the fauna of the locality.	The minor loss of fauna habitat is accounted for in the FBA calculations. The purchase of biodiversity credits includes a "punishment" for this direct impact.	Same as above	Property owner

Impact	How it is addressed	Outcome	Timing	Responsibility
Loss of tree hollows	<p>It is estimated that five (5) trees with twenty (20) hollows will be removed (Figure 14). All hollows will be inspected by removal using a camera probe under the inspection of a fauna ecologist. Artificial hollows are proposed for re installation on artificial poles and structures within proposed revegetation areas. 13 small hollows, 10 medium hollows, 5 microbat boxes and 1 large hollow will be installed.</p> <p>Replacement hollows/nest boxes will be designed to cater for common local fauna but also locally occurring hollow dependent threatened fauna such as East-coast Freetail Bat, Large-footed Myotis, Eastern Falsistrelle, Greater Broad-nosed Bat, Yellow-bellied Sheath-tail-bat and Little Lorikeet.</p> <p>Existing hollows are to be recovered from the hollow bearing trees where possible before any construction works to be used as on ground habitat or reused as replacements for artificial hollows.</p>	The tree hollows to be removed is accounted for in the BioBanking site attribute data (Appendix A, Table A.1). Its loss is therefore included in the credit calculation and the offset requirements.	Same as above	Property owner
Loss of EECs	CPW is proposed to be cleared are, while threatened, are also highly degraded and consist of mostly canopy species. The ground layer of vegetation is grazed and periodically slashed. The proportion of native species in the understorey averages less than 15% projected foliage cover.	The listing of vegetation communities to be cleared is accounted for in the FBA calculations. The purchase of biodiversity credits includes a "punishment" for this direct impact.	Same as above	Property owner
Loss of threatened fauna species	During the survey by <i>Travers Bushfire and Ecology</i> within the development site, Anabat surveys recorded either Greater Broad-nosed Bat or Eastern Freetail-bat.	Foraging habitat for the Greater Broad-nosed Bat and Eastern Freetail-bat is included in the FBA calculations. The purchase of biodiversity credits includes a	Same as above	Property owner

Impact	How it is addressed	Outcome	Timing	Responsibility
	The call identification was not fully confirmed, however both have been assumed as present as part of the FBA credit calculations. The Cumberland Plain Land Snail was not observed within any CPW remnants.	"compensation" for this direct impact.		
Loss of threatened flora species	No threatened flora species were found within the development site during the surveys.	The proposed development is unlikely to have an impact on any threatened flora species.	N/A	N/A
Degradation of aquatic habitats – loss of 0.69 ha of discontinuous first order stream and associated riparian zone	Mitigated by recreation of vegetated drainage swales	Fully stabilised sedgeland / drainage system integrated with the stormwater system	Construction <12 months	Property owner

**Table 6.2 - Extent and scale of indirect impacts**

Likely impact	Details	Extent/scale
Flora fragmentation	There will be no additional fragmentation of flora habitat. All patches of vegetation to be removed are already small and degraded remnants.	N/A
Fauna fragmentation	May reduce the capacity of some less mobile fauna to move within and between patches of remaining habitat.	Proposal will not sever fauna habitat corridors around the periphery of the land.
Fauna mortality	May result from collisions with vehicles or plant, or accidental entrapment in plant, trenches or other earthworks.	Most likely to occur during vegetation clearance and in a post development landscape.
Degradation of aquatic habitats	Potentially caused by loss of the existing discontinuous watercourse, mitigated by recreation of vegetated drainage swales	No offsite impacts expected
Impacts on fish passage	No impacts to fish passage	No offsite impacts expected
Edge effects and weed invasion	Vehicles and plant may transport weed propagules into the land. Creation of new edges will increase fragmentation and vulnerability of native vegetation to weed incursions	No offsite impacts expected
Alteration to air quality and noise	May impact upon the roosting, breeding and foraging activities of locally occurring fauna.	No offsite impacts expected

Figure 15 shows the potential direct impacts, and Figure 16 shows the potential indirect impacts.



Figure 15 – Potential direct impacts within the development site



Figure 16 – Potential indirect impacts within the development site



# Impact summary

# 7

## 7.1 Introduction

The project will involve some direct and indirect impacts on native vegetation and fauna habitat, due to clearing of 0.48 ha of native vegetation and minor indirect effects of construction and operation of the proposed facilities upon adjacent vegetation.

The development site comprises a total of 20.725 ha, which will impact on 0.48 ha of native vegetation to be cleared (i.e. 2.3%). The remaining development will be on previously cleared land which is grazed and contains dwellings (i.e. 97.7%).

A summary of unavoidable impacts is provided in Tables 6.1 and 6.2.

### 7.1.1 *Direct loss of native vegetation*

The proposal will remove 0.48 ha of native vegetation, from one PCT type, listed under the TSC Act as critically endangered. Under the BioBanking methodology, vegetation polygons are not only separated by vegetation type, but also by quality, which results in two (2) vegetation zones. The BioBanking credit calculator produces ecosystem credits for each of these vegetation zones. A summary of ecosystem credits required to offset these areas to be cleared within the development site is shown in Table 7.1.

**Table 7.1 Summary of ecosystem credits required**

Plant Community type	Area (ha)	Credits created
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.48	14.27
<b>Total</b>	<b>0.48</b>	<b>14</b>

### 7.1.2 *Direct loss of fauna habitat*

The credit calculator under the FBA not only calculates loss of native vegetation, but it also includes loss of connectivity to vegetation outside the impact area and loss of fauna habitat, such as fallen logs, tree hollows, exotic species and regeneration of canopy species. Species credits are required for this proposed development due to the assumed presence of two (2) microbat species and loss of hollow-bearings and vegetative habitat. A summary of all direct impacts by the proposed development is provided in Table 7.2.

The condition and nature of the habitats within the development site have been greatly altered by existing and historical land uses. The majority of the development site comprises cleared land (97.7%), which provides heavily degraded and poor habitat for most fauna species. The surveys show that the site provides habitat for highly mobile and common species which have adapted to the urban environment, as any remnant vegetation is

isolated. The clearing of 0.48 ha of native vegetation might result in loss of some habitat, such as:

- Fallen logs, woody debris and leaf litter – although limited within the development site, loss of shelter habitat for amphibians, reptiles and terrestrial mammals, and forage habitat for woodland bird species;
- Nectar-producing trees and shrubs – loss of some food resources for blossom dependant birds, arboreal mammals and mega chiropteran bats (flying-foxes);
- Shrubs and grasses – loss of food for a range of passerine birds and herbivorous mammals;
- Ephemeral drainage lines – loss of limited foraging, shelter and breeding habitat for amphibians, aquatic reptiles, wetland birds and aquatic mammals.

**Table 7.2 Summary of credit species credits required**

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	0.48	11
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	0.48	11

## 7.2 Thresholds for assessing unavoidable impacts

Unavoidable impacts of the project have been considered and a determination made of the assessment and offsetting requirements of such impacts. Table 7.3 summarises these requirements which include:

- Impacts that require further consideration by consent authority (FBA section 9.2);
- Impacts for which the assessor is required to determine an offset (FBA section 9.3);
- Impacts for which the assessor is not required to determine an offset (FBA section 9.4); and
- Impacts that do not require further assessment by the assessor (FBA section 9.5).

Figures 17 and 18 show the location of these areas within the Development Site. A discussion of each of these components is provided below.

**Table 7.3 - Thresholds for the assessment and offsetting of unavoidable impacts of the project**

Threshold	Biodiversity value	Criteria	Applicable to the project?
I. Impacts that require further consideration by consent authority	Landscape features	Impacts that will substantially reduce the width of vegetation in the riparian buffer zone bordering rivers and streams 4th order or greater	No
		Impacts in state biodiversity links	No
		Impacts on important wetlands and their buffers	No
		Impacts in the buffer zone along estuaries	No
	Native vegetation	Any impact on a CEEC (unless specifically excluded in the SEARs) because it is likely to: <ul style="list-style-type: none"> <li>• cause the extinction of the CEEC from the IBRA subregion, or</li> <li>• significantly reduce the viability of the CEEC</li> </ul>	No
Any impact on an EEC nominated in the SEARs because it is likely to: <ul style="list-style-type: none"> <li>• cause the extinction of the EEC from the IBRA subregion, or</li> <li>• significantly reduce the viability of the EEC</li> </ul>		No	

**Table 7.3 - Thresholds for the assessment and offsetting of unavoidable impacts of the project**

Threshold	Biodiversity value	Criteria	Applicable to the project?
	Species and populations	Impacts on areas of land that the Minister for Environment has declared as critical habitat in accordance with section 46 of the TSC Act and which is listed on the Register of Critical Habitat in NSW	No
		Any impact on a critically endangered species (unless specifically excluded in the SEARs)	No
		Any impact on a threatened species or population nominated in the SEARs because it is likely to: <ul style="list-style-type: none"> <li>• cause the extinction of a species or population from an IBRA subregion, or</li> <li>• significantly reduce the viability of a species or population</li> </ul>	No
		Any impact on a threatened species or population that has not previously been recorded in the IBRA subregion according to records in the NSW Wildlife Atlas	No
II. Impacts for which the assessor is required to determine an offset	Landscape features	Not applicable to the FBA	N/A
	Native vegetation	Impacts on CEECs that are specifically excluded from requiring further consideration in the SEARs	No
		Impacts on PCTs that are EECs not specifically nominated as requiring further consideration in the SEARs	0.48 ha of a CEEC will be removed, relating to PCT 849 – ME020
		Impacts on PCTs associated with threatened species habitat and which have a site value score $\geq 17$	The site value score ranged between 34 and 40 for the 2 zones with remnant native vegetation
	Species and populations	Impacts on a critically endangered species that is specifically excluded from requiring further consideration in the SEARs	No
		Impacts on threatened species, populations and threatened species habitat not specifically nominated as requiring further consideration in the SEARs	No
Impacts on threatened species habitat associated with a PCT and which has a site value score of $\geq 17$		The site value score ranged between 34 and 40 for the 2 zones with remnant native vegetation	
III. Impacts for which the assessor is not required to determine an offset	Landscape features	Not applicable to the FBA	N/A
	Native vegetation	Impacts on PCTs that: <ul style="list-style-type: none"> <li>• have a site value score <math>&lt; 17</math>, or</li> <li>• are not identified as CEECs / EECs</li> </ul>	No
		Impacts on PCTs that are not associated with threatened species habitat and are not identified as CEECs / EECs	No
	Species and populations	Impacts on non-threatened species and populations that do not form part of a CEEC or EEC	The project will impact on non-threatened species and populations

**Table 7.3 - Thresholds for the assessment and offsetting of unavoidable impacts of the project**

Threshold	Biodiversity value	Criteria	Applicable to the project?
			that do not form part of a CEEC or EEC.
		Impacts on threatened species habitat associated with a PCT within a vegetation zone with a site value score of <17	No
IV. Impacts that do not require further assessment by the assessor	Landscape features	Areas of land without native vegetation, unless the area of land requires assessment under the SEARs issued for the Major Project	No
	Native vegetation	Areas of land without native vegetation, unless the area of land requires assessment under the SEARs issued for the Major Project	The project will clear 20.245 ha of non-native vegetation
	Species and populations	Not applicable since all areas of land must be assessed for threatened species, even if they do not contain native vegetation	N/A

Figure 17 shows areas not requiring assessment and Figure 18 depicts PCTs requiring offsetting.

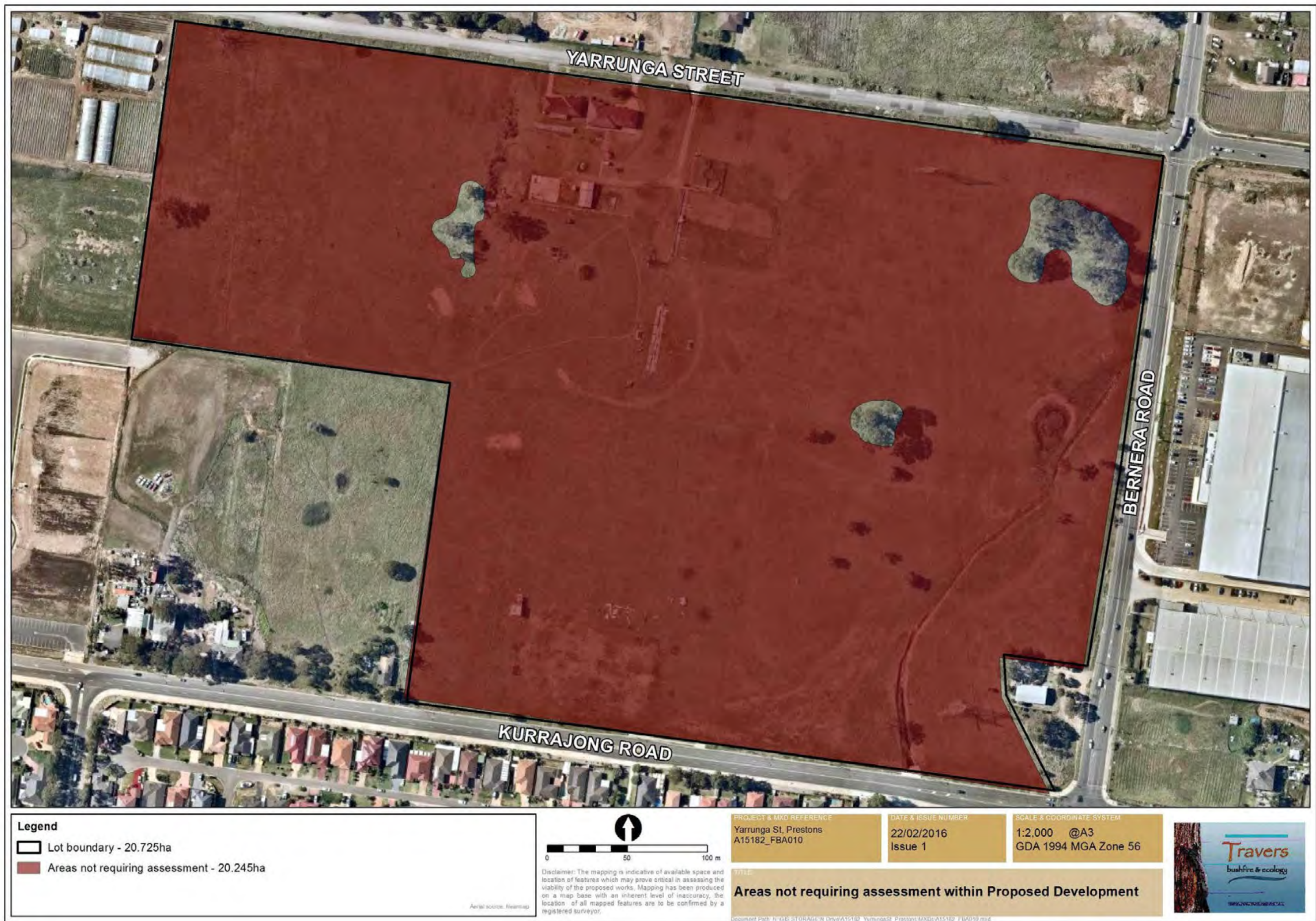


Figure 17 – Areas not requiring assessment within the development site



Figure 18 – PCTs requiring offsetting within the development site



# Conclusion & Offset Strategy

## 8

### 8.1 Purpose of the BAR

This BAR has been prepared to inform a State Significant Development (SSD) Application No. 7155 for the development at Lot 33-35 and 43 DP 2359, and Lot 20 DP 1173483 on the corner of Bernera Road and Yarrunga Road, Prestons. It has assessed the direct and indirect impacts of the proposal and has been prepared in accordance with the NSW *Framework for Biodiversity Assessment 2014* (OEH 2014a).

The BAR assesses the ecological impacts of the Project and so has responded to the SEARs as they relate to flora and fauna:

*All impacts on native vegetation on the site should be avoided wherever possible and, if not avoided, suitably offset. Potential impacts should be assessed in accordance with relevant Office of Environment and Heritage guidelines, by a person accredited in accordance with s142B(1)(c) of the Threatened Species Conservation Act 1995.*

### 8.2 Land use history and context of the land

The development site has long been used as a rural residential lot and grazed. There appears to have previously been crops on Lot 20 DP 1173483. The drainage line in the eastern portion of the development site once had some connective value to lands to the east, however those rural lands have been recently developed as industrial lands. The drainage line was also realigned sometime between 2007 and 2009 and no longer connects directly to any watercourse.

Currently there are two (2) adjoining residences on Yarrunga Street and associated outbuildings. Some paddocks are currently grazed and regularly slashed. The only regrowth area is that in the far north-east where there are some juvenile Eucalypt saplings emerging.

### 8.3 Summary of scale and extent of impacts

The project involves the full removal of native vegetation. The total amount of native vegetation amounts to 0.48 ha, over a total area of 20.725 ha. The 0.48 ha is covered in three (3) small patches, the largest being 0.31 ha in the far north-east corner of the study area.

Avoidance of such patches had not been considered feasible and retention of such vegetation would be of limited ecological value because of isolation and ongoing threats such as grazing pressures and continued slashing. There is no likelihood of restoring and regenerating habitat connectivity in the future due to the zoning of the land and lack of other remnants adjoining the development site.

The probable recording by Anabat of either Eastern Freetail-bat or Greater Broad-nosed bat has assumed both species are present given there are local and recent records for both species. There will be habitat loss for both species equating to 0.48 ha and removal of five (5) hollow-bearing trees.

The impact on biodiversity has been assessed by using the BioBanking credit calculator, which considers landscape values, patch size, quality of vegetation and fauna habitat. The resulting ecosystem credits are:

- 14 ecosystem credits for ME020 (Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin);
- 11 species credits for Eastern Freetail-bat; and
- 11 species credits for Greater Broad-nosed Bat.

Subject to approval of the alternative offset arrangements, these ecosystem credits are to be acquired from a BioBank site within the same or an adjoining IBRA sub-region.

There is potential for indirect impacts to surrounding lands but they are expected to be relatively well filtered given the proposed revegetation works around the perimeter of the site as a screening to adjoining properties. Indirect impacts could include but not be limited to:

- Sedimentation and run off;
- Noise, dust and light spill;
- Impacts to adjoining vegetation and habitat;
- Introduction of feral pests, weeds and pathogens;
- Infrequent or cumulative impacts; and
- Operations phase impacts (trampling of vegetation, rubbish dumping, noise etc).

## 8.4 Summary of state matters – terrestrial biodiversity

In respect of matters required to be considered under the *Environmental Planning and Assessment Act 1979* and relating to the species / provisions of the *Threatened Species Conservation Act 1995*, the following were recorded within development site:

- Acquiring and retiring of 14 BioBanking ecosystem credits in order to offset residual direct impacts, i.e. clearing of native vegetation and loss of fauna habitat.
- Cumberland Plain Woodland, assigned to PCT 849, ME020. Approximately 0.48 ha of degraded vegetation will be required to be cleared within the development site and does not form significant habitat for threatened species;
- Species credits are required for
  - Eastern Freetail-bat – 11 credits
  - Greater Broad-nosed Bat – 11 credits
- Cumberland Plain Land Snail (*Meridolum corneovirens*). The Cumberland Plain Land Snail was not recorded within the Development Site and so will not be directly impacted. No offsets are required for this species;
- No threatened flora species.

## 8.5 Summary of state matters – aquatic biodiversity

In respect of matters relative to the *Fisheries Management Act 1994*, no suitable habitat for threatened marine or aquatic species was observed within the development site and there are no matters requiring further consideration under this Act.

## 8.6 Summary of Commonwealth matters

In respect of matters required to be considered under the *Environment Protection and Biodiversity Conservation Act 1999*, the following were recorded within the development site:

- No protected migratory bird species;
- No threatened flora species; and
- No TECs.

The proposed project is not considered to have a significant impact on matters of national environmental significance. As such a referral to DoE is not required.

## 8.7 Biodiversity offset strategy

The proponent has put forward two options for meeting the requirements of the required credits:

- a. Providing revegetation offsets within the site of undetermined biodiversity ecosystem credit value and gaining the balance from the BioBanking market
- b. Full sourcing of the required ecosystem and species credits in accordance with the FBA methodology from the BioBanking market

These two (2) options are considered below.

### 8.7.1 Revegetation offsets

The proponent has proposed the use of 0.92 ha of revegetation areas within the proposed development site to offset part or all of the required credits. The arguments being that under a normal Part 5 development assessment, the CPW remnants would most likely not be conserved and revegetation works accepted as a suitable compensation for that loss. Given that the proposal will remove 0.48 ha and revegetate 0.92 ha, the outcome appears in principle to be a reasonable proposition.

In accordance with the Biobanking Assessment Methodology (BBAM 2014), the acquiring and retirement of credits is to be acquired from a BioBank site. The proponent requests the determining authority to approve a variation to this approach.

The proposed revegetation areas do have ecological value for the following reasons:

- Maintain a vegetated habitat stepping stone within the site suitable for resident and common fauna species;
- Are able to contain hollow habitat for hollow dependent threatened species;
- Assist in restoring maintaining CPW within the locality within a revegetated and managed landscape; and
- Provide ongoing vegetated visual screening.

The relative biodiversity offset credit value of the revegetation areas would need to be assessed against the required credits to determine the remaining credits required to be purchased from a BioBank site.

### 8.7.2 Sourcing required ecosystem and species credits from the BioBank market

With respect to locating suitable offsets, the BioBanking Public Register was utilised to gain an appreciation of the availability of the required ecosystem credits and species credits. The

outcome of the FBA was that 14 ecosystem credits were required for ME020 (PCT 849), 11 species credits for Eastern Freetail-bat and 11 species credits for Greater Broad-nosed Bat.

As at 29/02/16, there were no ME020 (PCT 849) ecosystem credits available on the BioBank public register, nor any species credits for both vulnerable listed (TSC Act) microbats.

Section 10.5 of the FBA manual stipulates the offset rules for biodiversity values.

*10.5.3 Using an ecosystem credit created at an offset site to offset a required ecosystem credit*

*10.5.3.1 An ecosystem credit created from a site assessed in accordance with the BioBanking Assessment Methodology (BBAM) is a matching ecosystem credit if:*

*(a) the PCT identified in the credit profile for the ecosystem credit created from an offset site is the same as any of the PCTs identified in attribute 1 of the required ecosystem credit, and*

*(b) the IBRA subregion identified in the credit profile for the ecosystem credit created from an offset site is the same as an IBRA subregion identified in attribute 2 of the required ecosystem credit.*

*10.5.3.2 A matching ecosystem credit may be used to offset a required ecosystem credit.*

Response:

There are currently no PCTs on the BioBanking Public Register that have an exact match. A supplementary or alternate offset needs to be acquired.

*10.5.4 Variation of the offset rules and supplementary measures for ecosystem credits*

*10.5.4.1 Subject to the offset rules set out in Subsection 10.5.3 the consent authority may approve:*

*(a) a variation of the offset rules for matching ecosystem credits, by allowing ecosystem credits created for a PCT from the same vegetation formation as the PCT to which the required ecosystem credit relates to be proposed as an offset, or*

*(b) a supplementary measure to be proposed as an offset for the PCT where the PCT is associated with an EEC or a CEEC.*

Response:

The BioBanking Public Register contains a series of offset sites which related to ME019 or PCT 850, Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion. This PCT has many of the same species recorded in PCT 849, however the main different is the topographic value; one being on coastal flats, the other being on an undulating landscape.

Both PCT 849 (on site) and PCT 850 incorporate the TSC CEEC Cumberland Plain Woodland, and as such, the ecological values are very similar, and fauna habitats are much the same.

If deemed appropriate by OEH, offsetting the loss of PCT 849 with PCT 850 would likely be sought.

10.5.4.2 The consent authority may approve a variation of the offset rules for matching ecosystem credits, by allowing ecosystem credits created for a PCT from the same vegetation formation as the required ecosystem credit to be proposed as part of the Biodiversity Offset Strategy (BOS), where in the consent authority's opinion the BOS demonstrates that:

- (a) all reasonable steps to secure a matching ecosystem credit have been taken by the proponent, and
- (b) the required ecosystem credit is not for a PCT associated with a CEEC listed on the TSC Act or an ecological community listed on the EPBC Act, and
- (c) the PCT from the same vegetation formation has a percent cleared value of the PCT in the major catchment area equal to or greater than the percent cleared of the PCT to which the required ecosystem credit relates, or
- (d) where the required ecosystem credit is for a PCT that is associated with a CEEC/EEC, the PCT from the same formation is also associated with an CEEC/EEC.

Response:

Searches on the BioBanking Public Register were undertaken on 29/02/16.

**Search results**

Your search for: IBRA sub-region - Cumberland  
 Plant community type - ME020/Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion  
 Credit status - Issued/Pending

No record for this search is found.

The screen shot shows there are no records of the required ME020 (PCT 849) on the register at this time.

The table below shows a series of ME019 credits that may be considered for purchase as a BioBanking site in accordance with 10.5.4.2 of the FBA Methodology.

ME019 (PCT 850) is the same TSC Cumberland Plain Woodland. It occurs in the same vegetation formation (grassy woodland) and has the same percent cleared as PCT 849.

**Table 8.1 - Ecosystem credits available for ME019 (PCT 850) - Cumberland Plain Woodland**

Credit ID/name	register	Agreement ID	Credit ID	Plant community code	IBRA sub-region	Vegetation formation	Credit status	Credits
Roads and Maritime Services		119	1979	ME019	Cumberland - Sydney Metro	GRW	Issued	117
Roads and Maritime Services		119	1976	ME019	Cumberland - Sydney Metro	GRW	Issued	47
Roads and Maritime Services		119	1977	ME019	Cumberland - Sydney Metro	GRW	Issued	36
Transport for NSW		70	251	ME019	Cumberland - Sydney Metro	GRW	Issued	33
Roads and Maritime Services		119	1975	ME019	Cumberland - Sydney Metro	GRW	Issued	28
Western Sydney Parklands Trust		119	1974	ME019	Cumberland - Sydney Metro	GRW	Issued	25

Western Sydney Parklands Trust	119	1978	ME019	Cumberland - Sydney Metro	GRW	Issued	17
Western Sydney Parklands Trust	119	1975	ME019	Cumberland - Sydney Metro	GRW	Issued	7
Transport for NSW	119	1979	ME019	Cumberland - Sydney Metro	GRW	Issued	5

### **10.5.6 Using a species credit created from an offset site to offset a required species credit**

10.5.6.1 *In this section, required species credit means a species credit calculated for a Major Project in accordance with Chapter 6.*

10.5.6.2 *A required species credit must be offset with a species credit created for the same species, determined in accordance with the BBAM.*

Response:

We have determined that no species credits are available for Eastern Freetail-bat or Greater Broad-nosed Bat. Therefore Clause 10.5.7 variation to the offset rules is proposed for consideration.

### **10.5.7 Variation of the offset rules and supplementary measures for species credits**

10.5.7.1 *Subject to the offset rules set out in Subsection 10.5.6, the consent authority may approve:*

*(a) a variation of the offset rules for matching species credits by allowing a different species to that impacted by the proposed development to be used to meet the offset requirement, or*

*(b) a supplementary measure to be proposed as an offset for the species impacted by the development.*

Response:

There are currently no species credits available for Eastern Freetail-bat and Greater Broad-nosed Bat. 11 species credits are required for each. A variation may be required, or supplementary measures.

10.5.7.2 The consent authority may allow species credits for a different species to that impacted by the proposed development to be used to meet the offset requirement where:

- (a) the proponent can demonstrate that all reasonable steps have been taken to secure the number and types of species credits impacted on at the development site, and
- (b) the species to which the species credit relates is not listed on the EPBC Act or listed as critically endangered on the TSC Act.

10.5.7.3 *In addition, the variation to use species credits for a different species must only be approved by the consent authority where:*

- (a) *the alternative species credits are created on land within the same IBRA region in which the proposed Major Project occurs, and*
- (b) *for fauna, the alternative species is a species or population from the same Order as the fauna species impacted on at the development site. In addition, the PCT containing threatened species habitat at an offset site is a PCT, which according to the Threatened Species Profile Database, is also associated with the fauna species impacted at the development site, or for flora, the alternative species is, according to the Threatened Species Profile Database, from the same life-form as the flora species impacted at the development site. In addition, the PCT containing the flora species at the offset site should preferably be the same PCT within which this species was located at the development site, and*
- (c) *the alternative species credits are for a species or population listed in either Schedule 1 or 1A of the TSC Act, where the species credit required for the proposed development relates to a species or population listed in Schedule 1 of the TSC Act, or*
- (d) *the alternative species credits are for a species or population listed in either Schedule 1, 1A or 2 of the TSC Act, where the species credit required for the proposed development relates to a species or population listed in Schedule 2 of the TSC Act.*

Response:

10.5.7.3 (b) states that the alternative species must be from the same Order. The species credits for Chiroptera species (the Order for bat species) are unattainable at present as there are no bats listed for species credits. Further variation of the rules is required or use of supplementary measures.

### **Use of supplementary measures for species credits**

10.5.7.5 *The consent authority may approve a variation of the offset rules for species credits by allowing supplementary measures to be proposed as part of the BOS for a species impacted at the development site where:*

- (a) *the species or population to which the species credit relates is not a species or population for which the impact of development requires further consideration according to Subsection 9.2.5, and*

- (b) *the proponent can demonstrate that all reasonable steps have been taken to secure the number and types of species credits impacted at the development site, and*
- (c) *the proposed supplementary measure only applies to the species impacted at the development site, and*
- (d) *the supplementary measure is carried out in accordance with the rules governing supplementary measures, including calculating the financial contribution of the supplementary measures in accordance with Appendix B of the NSW Biodiversity Offsets Policy for Major Projects.*

Response:

Consideration by OEH may be sought to incorporate additional ecosystem credits from ME019 (PCT 850) to counter-balance the species credits required which cannot be obtained by following the variation rules.

PCT 850 contains similar fauna habitat values to PCT 849, is located within the same IBRA region and sub-region (Cumberland) and contains similar botanical composition. Obtaining additional ecosystem credits for this PCT (850) may provide a suitable offset compensation given it would likely provide suitable habitat for those two (2) threatened fauna species that species credits cannot be obtained.

### **8.7.3 Sourcing of required credits to offset the loss of biodiversity value**

An assessment of sourcing the required ecosystem and species credits is provided within section 8.7 of this report. In summary and in accordance with the FBA Methodology, the required ecosystem credits can be obtained & retired via the following mechanisms:-

- Biobank site expressions of interest (EOI) register – sourcing the required credits from landowners who are interested in establishing biobank sites, but have not entered into a biobanking agreement.
- Credits wanted register – register the required credits on the credit wanted register to allow other assessors to link with proponents who are seeking biodiversity credits.
- Varying the rules to match PCT 849 on the project lands to PCT 850 in the same IBRA sub-region given it has similar values, forms part of the same TSC CEEC and has the same amount cleared. PCT 849 is not available on the BioBanking Public Register as at 29/02/16, however there are several available PCT 850 sites that would satisfy the 14 ecosystem credits required.
- Use variations and supplementary measures to offset the species credits required given that there are currently no species credits available for Eastern Freetail-bat and Greater Broad-nosed Bat. There are no species credits available for any Chiroptera, hence alternative or supplementary measures are required. It is recommended that OEH be contacted in regard to applying for additional ecosystem credits of PCT 850 as a supplementary measure as it would likely provide suitable habitat for those two (2) threatened fauna species that species credits cannot be obtained.
- Sourcing and establishing a biobank site of equivalent or greater credit value.

This report concludes that using the variations and supplementary measures the required offsets can be sourced from the open biobank market by:-

4. Varying the rules to allow to match PCT 849 on the project lands to PCT 850 in the same IBRA sub-region. Ecosystem credits for PCT 850 are available from the

Biobanking Public Register therefore all ecosystem credits can be sourced and retired

5. Use variations and supplementary measures to offset the 22 species credits required by applying for additional ecosystem credits of PCT 850 to be used to supplement the required species credits.
6. Sourcing and establishing a biobank site with the required ecosystem and species credits.

# References

- BOM (2015) *Groundwater Dependent Ecosystems Atlas*. Bureau of Meteorology.
- DECC (2002) *Descriptions for NSW (Mitchell) Landscapes - Version 2*.
- DECCW (2011) *Approved Cumberland Plain Recovery Plan*. DECCW, Hurstville.
- NSW NPWS (2003) *The Bioregions of New South Wales - their biodiversity, conservation and history*. NSW National Parks and Wildlife Service, Hurstville, NSW.
- OEH (2014)a *Framework for Biodiversity Assessment*. Office of Environment and Heritage for the NSW Government, Sydney.
- OEH. (2014)b *NSW Biodiversity Offsets Policy for Major Projects*. Office of Environment and Heritage for the NSW Government, Sydney.
- OEH (2015) *BioNet Atlas of NSW Wildlife*. Office of Environment and Heritage, Hurstville.
- SEWPaC (2012) *Environment Protection and Biodiversity Conservation Act, 1999*
- Sheather-Reid, M., L. Holmes, and C. Mead. 2015. *Flora and Fauna Assessment - Prestons. Travers Bushfire and Ecology*, Kariiong, NSW.
- Threatened Species Scientific Committee (2008) *Commonwealth Listing Advice on Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*. Department of Environment, Water, Heritage and the Arts, Canberra, ACT.
- Travers bushfire & ecology (2015) *Biodiversity Assessment – Corner Bernera Road and Yarrunga Street, Prestons*. Unpublished.

# Appendix A

## Plot and Transect Data

**Table A1 - Plot transect data from the development site**

<b>Plot attribute</b>	<b>Q1</b>	<b>Q2</b>	<b>Q3</b>	<b>Q4</b>	<b>Q5</b>
<b>PCT</b>	Nil	ME020	ME020	ME020	Nil
<b>Date</b>	5-Nov-15	5-Nov-15	5-Nov-15	5-Nov-15	5-Nov-15
<b>Easting</b>	302381	302515	302773	302917	302644
<b>Northing</b>	6242526	6242574	6242441	6242544	6242273
<b>Native plant species richness</b>	4	7	5	9	1
<b>Native over-storey cover</b>	0	11	13	22	0
<b>Native mid-storey cover</b>	0	3	0	2	0
<b>Native groundcover (grasses)</b>	2	3	3	8	2
<b>Native groundcover (shrubs)</b>	0	4	2	3	0
<b>Native groundcover (other)</b>	1	0	1	1	0
<b>Exotic plant cover</b>	93	88	90	87	96
<b>Number of trees with hollows</b>	0	1	2	0	0
<b>Over-storey regeneration</b>	0	0	0	1	0
<b>Total length of fallen logs</b>	0	0	11	13	0

# Appendix B

## Flora Species List

Table B1 – Flora species list for the development site

Family	Scientific Name	Common Name
<b>Trees</b>		
Mimosaceae	<i>Acacia decurrens</i>	Black Wattle
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree
<b>Shrubs</b>		
Mimosaceae	<i>Acacia falcata</i>	Sickle Wattle
Pittosporaceae	<i>Bursaria spinosa</i> var. <i>spinosa</i>	Native Blackthorn
Apocynaceae	<i>Gomphocarpus fruticosus</i> *	Narrow Leaf Cotton Bush
Oleaceae	<i>Ligustrum sinense</i> *	Small-leaved Privet
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn
Apocynaceae	<i>Nerium oleander</i> *	Oleander Bush
Rosaceae	<i>Rubus fruticosus</i> sp. agg.*	Blackberry Complex
Solanaceae	<i>Solanum sisymbriifolium</i> *	-
<b>Groundcovers</b>		
Asteraceae	<i>Ambrosia artemisifolia</i> *	Annual Ragweed
Myrsinaceae	<i>Anagallis arvensis</i> *	Scarlet Pimpernel
Poaceae	<i>Andropogon virginicus</i> *	Whisky Grass
Poaceae	<i>Austrodanthonia tenuior</i>	Wallaby Grass
Poaceae	<i>Avena fatua</i> *	Wild Oats
Poaceae	<i>Axonopus fissifolius</i> *	Narrow-leaved Carpet Grass
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs
Brassicaceae	<i>Brassica rapa</i> *	Wild Turnip
Poaceae	<i>Bromus cartharticus</i> *	Prairie Grass
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet
Brassicaceae	<i>Capsella bursa-pastoris</i> *	Shepherds purse
Asteraceae	<i>Carthamus lanatus</i> *	Saffron Thistle
Gentianaceae	<i>Centaurium erythraea</i> *	Pink Stars
Poaceae	<i>Chloris gayana</i> *	Rhodes Grass
Asteraceae	<i>Cirsium vulgare</i> *	Spear Thistle
Asteraceae	<i>Cotula coronopifolia</i> *	Waterbuttons
Poaceae	<i>Cynodon dactylon</i>	Common Couch
Cyperaceae	<i>Cyperus eragrostis</i> *	Umbrella Sedge
Cyperaceae	<i>Cyperus gracilis</i>	-
Poaceae	<i>Dichelachne micrantha</i>	Short-hair Plume Grass
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Poaceae	<i>Digitaria parviflora</i>	Small-flowered Finger Grass
Poaceae	<i>Ehrharta erecta</i> *	Panic Veldtgrass
Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>linifolia</i>	Climbing Saltbush
Chenopodiaceae	<i>Einadia polygonoides</i>	-
Cyperaceae	<i>Fimbristylis dichotoma</i>	Common Fringe-rush
Apiaceae	<i>Foeniculum vulgare</i> *	Fennel
Asteraceae	<i>Gamochaeta spicata</i> *	Cudweed
Clusiaceae	<i>Hypericum gramineum</i>	Small St Johns Wort
Clusiaceae	<i>Hypericum perforatum</i> *	St Johns Wort
Juncaceae	<i>Juncus acutus</i> *	-
Juncaceae	<i>Juncus remotiflorus</i>	-
Poaceae	<i>Lachnagrostis filiformis</i>	Blown Grass
Brassicaceae	<i>Lepidium africanum</i> *	Common Peppergrass

Family	Scientific Name	Common Name
Poaceae	<i>Lolium perenne</i> *	Perennial Ryegrass
Fabaceae	<i>Lotus suaveolans</i> *	Hairy Bird's Foot Trefoil
Malvaceae	<i>Malva sylvestris</i> *	Tall Mallow
Fabaceae	<i>Medicago polymorpha</i> *	Burr Medic
Poaceae	<i>Melinis repens</i> *	Red Natal Grass
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
Malvaceae	<i>Modiola caroliniana</i> *	Red-flowered Mallow
Haloragaceae	<i>Myriophyllum</i> sp.	-
Liliaceae	<i>Nothoscordum borbonicum</i> *	Onion Weed
Oxalidaceae	<i>Oxalis corniculata</i> *	Yellow Wood Sorrel
Oxalidaceae	<i>Oxalis perennans</i>	-
Poaceae	<i>Panicum simile</i>	Two Colour Panic
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Poaceae	<i>Paspalum urvillei</i> *	Vasey Grass
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu
Polygonaceae	<i>Persicaria decipiens</i>	Slender Knotweed
Plantaginaceae	<i>Plantago debilis</i>	Slender Plantain
Plantaginaceae	<i>Plantago lanceolata</i> *	Ribwort
Polygonaceae	<i>Rumex crispus</i> *	Curled Dock
Cyperaceae	<i>Schoenoplectus validus</i>	River Clubrush
Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed
Poaceae	<i>Sporobolus africanus</i> *	Parramatta Grass
Asteraceae	<i>Taraxacum officinale</i> *	Dandelion
Poaceae	<i>Themeda australis</i>	Kangaroo Grass
Anthericaceae	<i>Tricoryne elatior</i>	Yellow Rush Lily
Fabaceae	<i>Trifolium repens</i> *	White Clover
Typhaceae	<i>Typha australis</i>	Cumbungi
Urticaceae	<i>Urtica incisa</i>	Stinging Nettle
Verbenaceae	<i>Verbena bonariensis</i> *	Purpletop
Verbenaceae	<i>Verbena litoralis</i> *	Coastal Verbena
Verbenaceae	<i>Verbena rigida</i> *	Veined Verbena
Plantaginaceae	<i>Veronica plebeia</i>	Creeping Speedwell
<b>Vines</b>		
Fabaceae	<i>Glycine clandestina</i>	Twining Glycine
Fabaceae	<i>Glycine tabacina</i>	Variable Glycine
Fabaceae	<i>Vicia sativa</i> subsp. <i>sativa</i> *	Common Vetch
<b>Epiphytes</b>		
Loranthaceae	<i>Amyema pendulum</i>	Mistletoe
<b>* denotes exotic species</b>		

# Appendix C

## Fauna Species List

Table C1 – Fauna species list from the development site

Common name	Scientific name	Method observed	
<b>Birds</b>		<b>Nov 2015</b>	
Australian Magpie	<i>Gymnorhina tibicen</i>	O W	
Australian Raven	<i>Corvus coronoides</i>	O W	
Black-shouldered Kite	<i>Elanus axillaris</i>	O	
Cattle Egret	<i>Ardea ibis</i>	O	
Common Myna *	<i>Acridotheres tristis</i>	O W	
Common Starling *	<i>Sturnus vulgaris</i>	O W	
Crested Pigeon	<i>Ocyphaps lophotes</i>	O	
Eastern Rosella	<i>Platycercus eximius</i>	O W	
Little Corella	<i>Cacatua sanguinea</i>	O	
Magpie-lark	<i>Grallina cyanoleuca</i>	O W	
Masked Lapwing	<i>Vanellus miles</i>	O W	
Noisy Miner	<i>Manorina melanocephala</i>	O W	
Peregrine Falcon	<i>Falco peregrinus</i>	O	
Red-rumped Parrot	<i>Psephotus haematonotus</i>	O W	
Welcome Swallow	<i>Hirundo neoxena</i>	O W	
Willie Wagtail	<i>Rhipidura leucophrys</i>	O W	
<b>Mammals</b>			
Brown Hare *	<i>Lepus lepus</i>	O	
Domesticated Cattle *	<i>Bos taurus</i>	O	
Eastern Falsistrelle <sup>TS</sup>	<i>Falsistrellus tasmaniensis</i>	U <sup>PO</sup>	
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	U	
Greater Broad-nosed Bat <sup>TS</sup>	<i>Scoteanax rueppelli</i>	U <sup>PO</sup>	
Horse *	<i>Equus caballus</i>	O	
White-striped Mastiff-bat	<i>Austronomus australis</i>	U	
<b>Reptiles</b>			
Cream-striped Shining Skink	<i>Cryptoblepharus virgatus</i>	O	
Eastern Blue Tongue Lizard	<i>Tiliqua scincoides</i>	O	
<b>Amphibians</b>			
Common Eastern Froglet	<i>Crinia signifera</i>	W	
Dwarf Tree Frog	<i>Litoria fallax</i>	W	
Peron's Tree Frog	<i>Litoria peronii</i>	W	
Striped Marsh Frog	<i>Limnodynastes peronii</i>	W	
Whistling Tree Frog	<i>Litoria verreauxii</i>	W	
<p>Note: * indicates introduced species  <sup>TS</sup> indicates threatened species</p> <p>All species listed are identified to a high level of certainty unless otherwise noted as:  <sup>PR</sup> indicates species identified to a „probable“ level of certainty – more likely than not  <sup>PO</sup> indicates species identified to a „possible“ level of certainty – recorded to a moderate to high level of uncertainty usually applied to a threatened species of note.</p>			
E - Nest/roost	H - Hair/feathers/skin	P - Scat	W - Heard call
F - Tracks/scratchings	K - Dead	Q - Camera	X - In scat
FB - Burrow	O - Observed	T - Trapped/netted	Y - Bone/teeth/shell
G - Crushed cones	OW - Obs & heard call	U - Anabat/ultrasound	Z - In raptor/owl pellet

# Appendix D

## BioBanking Report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 23/02/2016

Time: 2:05:52PM

Calculator version: v4.0

## Major Project details

**Proposal ID:** 199/2016/2429MP

**Proposal name:** Prestons

**Proposal address:** Yarrunga Street Prestons NSW 2170

**Proponent name:** DBL Property Pty Limited

**Proponent address:** PO Box A966 Sydney South NSW 1235

**Proponent phone:** 02 9267 4267

**Assessor name:** Lindsay Holmes

**Assessor address:** PO BOX 7138 Kariong NSW 2250

**Assessor phone:** 0414 365 723

**Assessor accreditation:** 199

## Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.48	14.27
<b>Total</b>	0.48	14

## Credit profiles

### 1. Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (ME020)

Number of ecosystem credits created	14
IBRA sub-region	Cumberland - Sydney Metro

Offset options - Plant Community types	Offset options - IBRA sub-regions
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (ME020)	Cumberland - Sydney Metro and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

## Summary of species credits required

<b>Common name</b>	<b>Scientific name</b>	<b>Extent of impact Ha or individuals</b>	<b>Number of species credits created</b>
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	0.48	11
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	0.48	11