

BRICKWORKS - HORSLEY PARK

Ecological Services

For:

Travers bushfire & ecology

October 2015

Final Report



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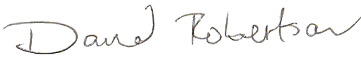
Report No. 15164RP1

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Date: 26 October, 2015

Table of Contents

1 INTRODUCTION

1.1	Purpose	1.1
1.2	Project Description	1.1
1.2.1	Location	1.1
1.2.2	Overview	1.2
1.2.3	Identification of Development Site Footprint	1.3
1.3	General Description of Development Site	1.3
1.4	Information Sources	1.4
1.4.1	Database Analysis	1.4
1.4.2	Literature Review	1.4
1.4.3	Aerial Photography	1.4

2 LEGISLATION AND POLICIES

2.1	Commonwealth	2.1
2.1.1	Environment Protection and Biodiversity Conservation Act 1999	2.1
2.1.2	Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy	2.1
2.2	New South Wales	2.2
2.2.1	Environmental Planning and Assessment Act 1979	2.2
2.2.2	Threatened Species Conservation Act 1995	2.2
2.2.3	Fisheries Management Act 1994	2.3
2.2.4	NSW Biodiversity Offsets Policy for Major Projects	2.3

3 LANDSCAPE FEATURES

3.1	Landscape Features	3.1
3.1.1	IBRA Bioregions and IBRA Subregions	3.1
3.1.2	Mitchell Landscapes	3.2
3.1.3	Rivers and Streams	3.2
3.1.4	Wetlands	3.3
3.1.5	Native Vegetation Extent	3.3

Table of Contents *(Cont'd)*

	3.1.6 State or Regionally Significant Biodiversity Links	3.3
	3.1.7 Other Landscape Features	3.3
3.2	Landscape Value Score	3.4
	3.2.1 Attributes	3.4
	3.2.2 Score	3.5
4	NATIVE VEGETATION	
4.1	Review of Existing Data	4.1
4.2	Field Survey	4.1
4.3	Native Vegetation Extent within the Development Site	4.3
4.4	Identification of Plant Community Types	4.5
	4.4.1 Threatened Ecological Communities	4.10
	4.4.2 Description of Plant Community Types within the Development Site	4.12
4.5	Vegetation Zones	4.15
4.6	Groundwater Dependent Ecosystems	4.16
5	THREATENED SPECIES AND POPULATIONS	
5.1	Review of Existing Data	5.1
5.2	Field Survey	5.1
	5.2.1 Habitat Assessment	5.1
	5.2.2 Targeted Threatened Species Surveys	5.1
	5.2.3 Survey Limitations	5.4
5.3	Fauna Habitats within the Development Site	5.4
	5.3.1 Woodland Habitat	5.4
	5.3.2 Aquatic Habitat	5.5
5.4	Ecosystem Credit Species	5.5
	5.4.1 Predicted Ecosystem Credit Species	5.5
5.5	Species Credit Species	5.9
	5.5.1 Candidate Species Credit Species	5.9
	5.5.2 Candidate Species for Further Assessment	5.9

Table of Contents *(Cont'd)*

5.5.3	Presence of Candidate Species	5.20
6	AVOID AND MINIMISE IMPACTS	
6.1	Avoidance Measures	6.1
6.2	Mitigation Measures	6.2
6.3	Impacts that cannot be Avoided or Mitigated	6.4
7	IMPACT SUMMARY	
7.1	Introduction	7.1
7.1.1	Direct Loss of Native Vegetation	7.1
7.1.2	Direct Loss of Fauna Habitat	7.2
7.2	Thresholds for Assessing Unavoidable Impacts	7.3
8	CONCLUSION	
REFERENCES		

List of Appendices

A.	PLOT AND TRANSECT DATA
B.	FLORA SPECIES LIST
C.	FAUNA SPECIES LIST
D.	BIOBANKING REPORT

List of Tables

3.1	Current and future extent of native vegetation within the assessment circles	3.4
3.2	Current and future connecting links within the assessment circle	3.5
4.1	Plot and transect survey effort	4.2
4.2	Justification for selection of PCTs within the Development Site	4.6

List of Tables

4.3	Summary of PCTs occurring within the Development Site	4.7
4.4	TECs associated with PCTs occurring within the Development Site	4.10
4.5	Evaluation of HN528 at Development Site against EPBC Act listing advice thresholds	4.10
4.6	Vegetation zones within the Development Site	4.16
5.1	Fauna survey effort (from Travers Bushfire and Ecology report^)	5.3
5.2	Predicted ecosystem credit species	5.7
5.3	Assessment of potential presence of species credit species	5.11
5.4	Summary of surveys undertaken for candidate species credit species	5.20
6.1	Summary of Direct Impacts	6.5
6.2	Extent and Scale of Indirect Impacts	6.1
7.1	Summary of Ecosystem Credits required	7.1
7.2	Thresholds for the assessment and offsetting of unavoidable impacts of the Project	7.4
A.1	Plot and Transect Data from the Development Site and Adjacent Land	A.1
B.1	Flora Species List from Development Site and Adjacent Land	B.1
C.1	Fauna Species list from the Development Site and Adjacent Land	C.1

List of Figures

1.1	Site Map: 780 Wallgrove Road	1.5
1.2	Location Map: 780 Wallgrove Road	1.6
1.3	Development Site footprint	1.7
4.1	PCTs within the Development Site	4.17
4.2	TECs within the Development Site	4.18
4.3	Vegetation zones within the Development Site	4.19
4.4	Plot and transect locations within the Development Site	4.20
5.1	Targeted species credit species survey locations	5.22
6.1	Potential indirect impact zones	6.2
7.1	Areas not requiring assessment	7.7
7.2	PCTs requiring offset	7.8

List of Photographs

4.1	Non-native vegetation on constructed bunds within the Development Site
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List of Photographs

	(looking north)	4.4
4.2	Non-native vegetation on constructed bunds within the Development Site (note brick fragments and overburden material)	4.4
4.3	Broadleaf Cumbungi (<i>Typha orientalis</i>) fringing a dam	4.8
4.4	Habitat of fringing Broadleaf Cumbungi (<i>Typha orientalis</i>); inlet pipe location indicated by red arrow	4.8
4.5	Planted trees and shrubs on constructed bund	4.9
4.6	Plantings on constructed bund evidenced by the yellow tree guards	4.9
4.7	HN526 in the south eastern portion of the Development Site (note Kikuyu understorey, topsoil disturbance and canopy age)	4.13
4.8	HN526 in the north western portion of the Development Site (note African Olive in midground)	4.13
4.9	HN526 in the centre of the Development Site near the dam	4.14
4.10	HN528 within the Development Site (left: constructed bund; right: edge of haul road)	4.15

Glossary of Terms

AHD	Australian Height Datum
BAR	Biodiversity Assessment Report
BBAM	BioBanking Assessment Methodology
BOM	Bureau of Meteorology
BOS	Biodiversity Offset Strategy
DA	Development Application
DECCW	Department of Environment Climate Change and Water
Development Site	The Project disturbance area shown in Figure 1.3
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 of the Austral Bricks land
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 Austral Bricks land
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TEC	Threatened Ecological Community

the Austral Bricks land	Refers to the property at 780 Wallgrove Road, Horsley Park
the Project	The proposal to alter and extend the existing Brickworks facility at Horsley Park
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
VIS	Vegetation Information System

Introduction

Cumberland Ecology was commissioned by Travers Bushfire and Ecology to prepare a Biodiversity Assessment Report (BAR) for alterations and additions to the existing Brickworks facility at Horsley Park (the 'Project').

1.1 Purpose

This BAR has been prepared to inform a State Significant Development (SSD) Application for the development proposal at Plant Number 2 of the existing Brickworks facility. 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 an Environmental Impact Statement (EIS) prepared for the proposal by the McKenzie Group (McKenzie Group Consulting Planning 2015). It should be read in conjunction with the EIS and associated development plans submitted with the SSD.

1.2 Project Description

The proposal seeks to construct a Light Weight Aggregate Facility on the land at 780 Wallgrove Road, Horsley Park. The proposal is hereafter referred to in this BAR as 'the Project'.

1.2.1 Location

The Project is located within the existing Brickworks facility at Plant Number 2, 780 Wallgrove Road, Horsley Park (the Austral Bricks land). The specific area of the proposed Project works within the Austral Bricks land is referred to in this BAR as 'the Development Site'.

The Austral Bricks land lies within the Fairfield Local Government Area (LGA), approximately 4 km north-east of the Horsley Park town centre. The Austral Bricks land is bordered by the Westlink M7 and Wallgrove Road to the west and Ferrers Road to the east (**Figure 1.2**).

Access to the Brickworks facility is from the north via Wallgrove Road. The Development Site is wholly located within Lot 7 DP 1059698. The location of the Project is shown in **Figure 1.1** and **Figure 1.2**.

1.2.2 Overview

The Project aims to utilise a stockpile area on the Austral Bricks land to construct a new kiln and screening plant, and also to recycle the existing stockpiles of material to manufacture concrete aggregate and ancillary site works. The Project also proposes to use existing assets associated with Plant Number 2 including the primary crusher and extruders. The use of the facility is to manufacture concrete aggregate.

The SSD for the alterations and additions to Plant Number 2 at the Brickworks facility seek approval for:

- A clay preparation system, with the existing facility being retained;
- A proposed rotary kiln that will be constructed to the west of the existing brickworks and consist of a long metal tube around 70m;
- A multi fuel burner that will act as the energy source for the kiln. Natural gas to be the main fuel source but with ability to use alternate sources such as clean timber / saw dust;
- Solid fuel storage and preparation;
- Storage and stockpiling – finished product conveyed to main stockpile area for storage. Conveyor will discharge at a height of around 25m into a slotted metal cylinder which allows product to pass through and gravity settle;
- Crushing and screening – area where product is screened to produce graded stockpiles (i.e. 10mm, 15mm and 20mm product). Crushing will be limited due to extrusion process providing sized product (eliminating need to crush as this is expensive);
- Roadways and truck loading facilities – main entrance with separate in and out lanes and weighbridge. Internal roadways will allow for 2 lanes of traffic and will contain truck loading areas next to the graded stockpiles. Loading will be undertaken by a front end loader; and
- Staff offices and amenities – office for 10 people with amenities for 20.

Further details are provided within Part C in the EIS.

1.2.3 Identification of Development Site Footprint

The extent of the construction and operational footprints is shown in **Figure 1.3** and is referred to as 'the Development Site'. The construction footprint of the Project will encompass all works associated with the Project and is wholly contained within the Development Site.

The construction footprint includes all roads, precincts, earthworks, set down areas, bio-retention basins and temporary fencing. The operational footprint of the Project for this assessment will include all of the components (1-8) listed above.

1.3 General Description of Development Site

i. Landform, Geology and Soils

The Austral Bricks land is situated approximately 60-70m AHD on a mostly flat landscape, previously altered through quarrying works. There are no large variances in topography like mountains or cliff lines,

Outside of the riparian influence on the western boundary, the geology is Bringelly Shale, characterised by shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff. Within the riparian zone are Quaternary Alluvials, comprising fine-grained sand, silt and clay. There are two soil types within the Development Site including:

1. Blacktown Soil Landscape – Brown to red podzolic soils on crests grading to yellow podzolic soils on lower slopes and drainage lines. The soils are shallow to moderately deep.
2. South Creek Soil Landscape along Eastern Creek – A fluvial landscape with very deep layered sediments over bedrock or relict soils.

ii. Vegetation

The majority of the Development Site has been altered through past quarrying. Alluvial forest vegetation occurs in the north-western portion of the Development Site in close proximity to existing watercourses and drainage lines, most of which has been heavily impacted through weed invasion. Woodland vegetation occurs along the eastern and southern boundaries. The eastern boundary vegetation is moderately to heavily impacted by previous clearing and weed invasion. There is a stand of Woodland around the mill area, however, it has been formed by regrowth after clearing and contains no mid-storey. There has been revegetation works undertaken in several other locations around the site.

iii. Hydrology

The Development Site lies within the Hawkesbury-Nepean Catchment along Eastern Creek. It drains to Eastern Creek, a second order stream, which flows into Hawkesbury River 25 km

north of the Austral Bricks land. One minor drainage line within the Development Site is in relatively poor condition, due to past quarrying and historic clearing.

iv. *Land Uses*

The Development Site has been previously utilised for the purpose of quarrying. This land use has resulted in the majority of the Development Site being extensively cleared of vegetation which has resulted in a significant loss of flora and fauna habitats. Land surrounding the Development Site has also been affected by past quarrying.

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;
- 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) Atlas of Groundwater Dependent Ecosystems.

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 associated with the Development Site. Key documents reviewed for this BAR include:

- McKenzie Group (2015) *Environmental Impact Statement: Proposed Light Weight Aggregate Facility 780 Wallgrove Road, Horsley Park (Lot 7 in DP1059698)*. Prepared by McKenzie Group Consulting Planning on behalf of Lumetum Pty Ltd;
- Sheather-Reid, M., Holmes, L. and Mead, C. (2015). *Flora and Fauna Assessment - 780 Wallgrove Road, Horsley Park*. Travers Bushfire and Ecology, Kariong, NSW; and
- Cumberland Plain Vegetation Mapping (DECCW 2007).

1.4.3 *Aerial Photography*

The aerial imagery used was taken from Google Earth Pro cited to Aerometrex. This aerial is dated 1-01-2014



- Legend**
- Development Site
 - Lot Boundary
 - Native Vegetation
 - Sydney Basin IBRA Bioregion (boundary not visible at current map scale)
 - Cumberland IBRA Subregion (boundary not visible at current map scale)
 - Mitchell Landscape
- Rivers and Streams**
- 1st Order Stream
 - 2nd Order Stream
 - Riparian Buffer Areas

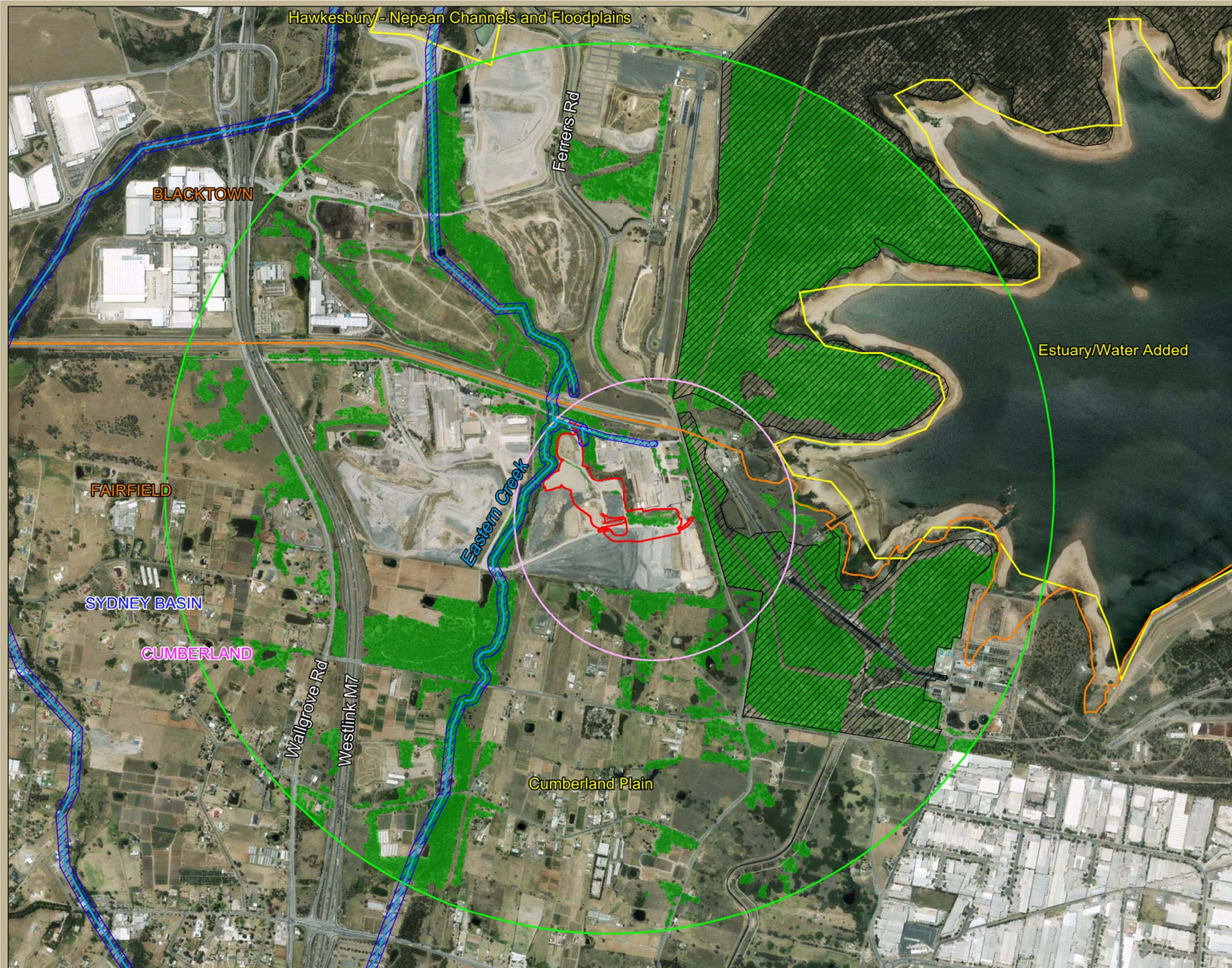
Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
DECCW (2008). Landscapes (Mitchell)
of NSW - Version 3.;
DSEWPac (2012). Interim
Biogeographic Regionalisation for Australia
(IBRA) - Version 7.;
© Copyright Commonwealth of Australia
(Geoscience Australia) 2006;
© 2015 NSW Land and Property
Management Authority,
SIX Viewer;
DECCW (2008). Change in the
Distribution of Cumberland Plain
Woodland. Department of Environment,
Climate Change and Water NSW.



Figure 1.1. Site Map: 780 Wallgrove Road





Legend

- Development Site
- Inner Assessment Circle (100 ha)
- Outer Assessment Circle (1000 ha)
- Native Vegetation
- Cumberland Plain Priority Conservation Lands
- Sydney Basin IBRA Bioregion (boundary not visible at current map scale)
- Cumberland IBRA Subregion (boundary not visible at current map scale)
- Mitchell Landscape
- Local Government Area

Rivers and Streams

- 1st Order Stream
- 2nd Order Stream
- Riparian Buffer Areas

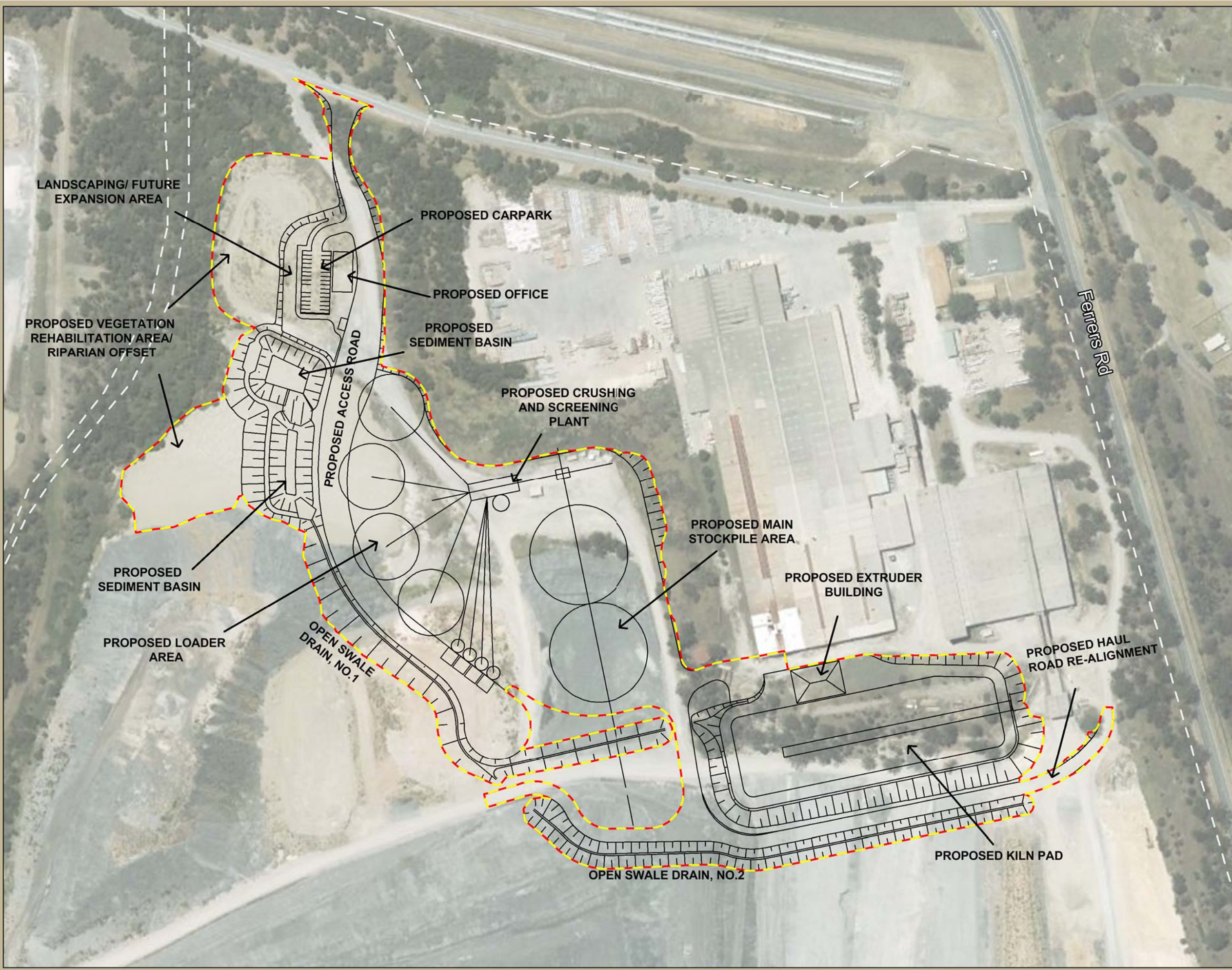
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Data Source:
DECCW (2008). Landscapes (Mitchell) of NSW - Version 3.;
DSEWPac (2012). Interim Biogeographic Regionalisation for Australia (IBRA) - Version 7.;
© Copyright Commonwealth of Australia (Geoscience Australia) 2006;
LPI (2001). New South Wales DCDB Local Government Area Boundaries.;
DECCW (2011). Cumberland Plain Recovery Plan Area.;
DECCW (2008). Change in the Distribution of Cumberland Plain Woodland. Department of Environment, Climate Change and Water NSW.

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Figure 1.2. Location Map: 780 Wallgrove Road





- Legend**
- Development Site
 - Lot Boundary
 - Construction and Operational Footprint
 - Proposed Development

Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
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Management Authority,
SIX Viewer



Figure 1.3. Development Site footprint



Legislation and Policies

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. The Grey-headed Flying-fox (*Pteropus poliocephalus*) was the only MNES identified within the Austral Bricks land.

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.

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.

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 17 December 2014. 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.

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.

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 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.

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 Fairfield LGA. The Lot boundary includes Eastern Creek Tributary, a first order stream (see **Figure 1.1** and **Figure 1.2**), which is not considered as key fish habitat.

Landscape Features

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 (approximately 4.5% of NSW) and extends from just north of Batemans Bay to Nelson Bay on the central coast, 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 extent of the Sydney Basin bioregion in relation to the Development Site and the outer assessment circle is shown in **Figure 1.2**.

ii. Subregions

Development Site: Cumberland Subregion (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).

The extent of the Cumberland subregion in relation to the Development Site and the outer assessment circle is shown in **Figure 1.2**.

3.1.2 Mitchell Landscapes

Development Site: Cumberland Plain (100%)

Outer assessment circle: Cumberland Plain (100%)

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 extent of the Cumberland Plain Mitchell Landscape in relation to the Development Site and the outer assessment circle is shown in **Figure 1.2**.

3.1.3 Rivers and Streams

The Development Site and outer assessment circle occurs within the Hawkesbury-Nepean Catchment. One first order stream, a tributary to Eastern Creek, has been identified within the northern corner of the Development Site and the outer assessment circle. Additionally, within the outer assessment circle and adjacent to the western boundary of the Development Site, a second order stream, Eastern Creek, has been identified. Stream data was obtained from Geoscience Australia, with stream orders defined using the Strahler stream ordering system. A buffer of 10 m and 20 m either side of the waterways applies to first and second order streams, respectively. Eastern Creek Tributary flows west into Eastern Creek, which flows north, eventually reaching South/Wianamatta Creek which is located 20 km north of the Development Site. The Eastern Creek tributary within the Development Site is ephemeral and did not have any water at the time of survey by Cumberland Ecology staff.

The extent of the streams and their associated buffers within the Development Site is shown in **Figure 1.1**. The extent of the streams and their associated buffers within the outer assessment circle is shown in **Figure 1.2**.

3.1.4 Wetlands

No important or local wetlands occur within the Development Site or outer assessment circle. The closest wetlands to the Development Site are located more than 20 km to the north near Windsor Downs, where South/Wianamatta Creek and Eastern Creek merge.

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 2008 update to the vegetation mapping of the Cumberland Plain (DECCW 2007) was overlain on a 2014 aerial available through the Google Earth Pro application. The extent of native vegetation cover was then revised through aerial photographic interpretation and surveys of the Development Site. Amendments to the extent of native vegetation were made using a Geographic Information System (GIS), MapInfo Professional 12.5. The boundaries of native vegetation were reduced in areas that have been cleared since the DECCW mapping was prepared and the boundaries were extended in areas where the DECCW mapping

Native vegetation occurring in the outer assessment circle is shown in **Figure 1.2**. Native vegetation occupies 258.6 ha, which represents 25.9% of the outer assessment circle. Native vegetation within the outer assessment circle is predominately confined to riparian vegetation along Eastern Creek and Prospect Reservoir, with some larger patches also occurring. The remaining areas within the outer assessment circle comprise cleared land and waterways.

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 occur within the outer assessment circle, directly to the east of the Development Site and are shown on **Figure 1.2**. These areas link Priority Conservation Lands identified within the Approved Cumberland Plain Recovery Plan (DECCW 2011).

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. The assessment circles were centred over the area of native vegetation that is most impacted by the Project. The locations of the inner and outer assessment circles are shown in **Figure 1.2**.

The current and future percentage of native vegetation cover within the inner and outer assessment circles was determined in increments of 5% using GIS. These calculations utilised the native vegetation extent identified in **Section 3.1.5** and the Development Site. The Project will result in the loss of 0.74 ha of native vegetation within the Development Site. A summary of the current and future percentage of native vegetation cover in the inner and outer assessment circles is provided in **Table 3.1**.

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	21.9	21.9	21-25	21.1	21.1	21-25
Outer assessment circle	258.6	25.9	26-30	257.8	25.8	26-30

ii. Connectivity Value

The main connecting links within the outer assessment circle are along the riparian vegetation of Eastern Creek and Prospect Reservoir. The vegetation along the northern and eastern boundary of the Lot is connecting these two corridors, most of which is outside the Development Site and will not change due to this proposal. The only current connectivity within the Development Site includes:

- Linkage width: 7.1 m (i.e. >5-30m);
- Over-storey condition: % foliage cover within benchmark; and
- Mid-storey or groundcover condition: % foliage cover of mid-storey or ground cover within benchmark;

The vegetated link is in moderate to good condition, has a patch size of greater than one hectare, is separated by less than 100 m and is not separated by a hostile link. The

proposed development will slightly reduce the width of the main link to < 5m. The resulting connectivity value is shown in **Table 3.2** below.

Table 3.2 Current and future connecting links within the assessment circle

Connecting Link	Linkage Width Class			Linkage Condition Class			Connectivity Value
	Current	Future	Classes Crossed	Current	Future	Classes Crossed	
1	Narrow (>5-30m)	Very Narrow (0-5m)	1	3	3	0	2

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 and assessment circles has been identified in **Section 3.1.5**. Of this vegetation, the largest patch of native vegetation, of which a portion occurs within the Development Site, is >1,000 ha in size. Based on the Cumberland Plain Mitchell Landscape, the patch size class of this vegetation is categorised as 'Extra large' which has a corresponding patch size score of 12.

3.2.2 Score

Using the results from the assessment of landscape attributes in **Section 3.2.1** and Equation 4 in Appendix 1 of the FBA, the landscape value score for the Development Site is 14

Native Vegetation

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;
- Cumberland Plain Vegetation Mapping (DECCW 2007); and
- A flora and fauna assessment of the Development Site and Austral Bricks land, undertaken by Travers Bushfire and Ecology (Sheather-Reid et al. 2015).

Information obtained during the review of existing data was utilised in conjunction with recent field data collected by Cumberland Ecology to assess native vegetation within the Development Site.

4.2 Field Survey

Floristic survey of the vegetation within the Development Site was undertaken by two ecologists on 20 October, 2015.

For the purposes of assigning Plant Community Types (PCT) to native vegetation communities, plot based full floristic survey was undertaken in accordance with Table 1 of the FBA at five sites across the Development Site. Transect surveys were also undertaken at the same locations (**Figure 4.4**).

The following information was collected at each of the five 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); and

- 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.

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; and
- 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 and Transect Sites Required	Number of Plot and Transect Sites Sampled
1	Moderate to good	0.09	1	1
2	Moderate to good_poor	0.24	1	1
3	Moderate to good	0.41	1	1

4.3 Native Vegetation Extent within the Development Site

The Development Site is 8.68 ha in size, which includes 1.01 ha of native vegetation and 7.67 ha of cleared land. The native vegetation extent within the Development Site is shown in **Figure 1.1** and has been determined through aerial photograph interpretation and field surveys.

The native vegetation extent shown in **Figure 1.1** includes two native vegetation community types. It also includes a mix of native trees and shrub species that were planted at the top of a constructed bund, as well as a fringe of *Typha orientalis* (Broadleaf Cumbungi) that self-established on the edge of the brick pit dam. The planted trees and shrubs and the fringing *Typha orientalis* do not comprise a naturally occurring vegetation community but are included within the mapped native vegetation extent because they represent Australian native plant species.

There are areas of the Development Site that appear vegetated on the aerial but that have not been mapped as native vegetation. These areas were ground-truthed during site surveys on the 20 October 2015 by two ecologists and were confirmed to be non-native vegetation that had established opportunistically on constructed bunds comprised of a mixture of brick rubble and overburden. The species that were recorded in such areas include those listed below:

- *Ricinus communis* (Castor Oil Plant);
- *Conyza bonariensis* (Flaxleaf Fleabane);
- *Sonchus oleraceus* (Common Sowthistle);
- *Pennisetum clandestinum* (Kikuyu);
- *Modiola caroliniana* (Red-flowered Mallow); and
- *Solanum sisymbriifolium*.

Photographs 4.1 and **4.2** illustrate the condition of such areas.

These areas of non-native vegetation, in combination with the remaining areas the Development Site, comprise cleared land and dams. In accordance with Section 5.1.1.3 of the FBA, these areas do not require further assessment unless they provide habitat for species credit species.



Photograph 4.1 Non-native vegetation on constructed bunds within the Development Site (looking north)



Photograph 4.2 Non-native vegetation on constructed bunds within the Development Site (note brick fragments and overburden material)

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 existing data (see **Section 4.1**) and surveys of the Development Site (see **Section 4.2**). 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; and
- Dominant upper, mid and ground strata species.

The analysis determined that the vegetation within the Development Site aligned with two PCTs held within the VIS Classification Database. **Table 4.2** lists the PCTs that have been identified within the Development Site and the justification for their selection.

Table 4.2 Justification for selection of PCTs within the Development Site

PCT Code	PCT Name	Evidence Used for Identification	Species Relied upon for Identification
HN526	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	IBRA Subregion: Occurs within the Cumberland IBRA subregion Vegetation formation: Coastal Valley Grassy Woodlands Landscape position: Occurs on stream banks and alluvial flats on the Cumberland Plain	Upper stratum species: <i>Eucalyptus tereticornis</i>, <i>Casuarina glauca</i>, <i>Melaleuca decora</i> Mid stratum species: <i>Acacia parramattensis</i>, <i>Acacia decurrens</i>, <i>Bursaria spinosa</i> Ground stratum species: <i>Dichondra repens</i>, <i>Microlaena stipoides</i>, <i>Brunoniella australis</i>, <i>Atriplex semibaccata</i>, <i>Clematis glycinoides</i>, <i>Chamaesyce drummondii</i>, <i>Rytidosperma fulvum</i>, <i>Aristida vagans</i>, <i>Sporobolus creber</i>, <i>Glycine clandestina</i>
HN528	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	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).	Upper stratum species: <i>Eucalyptus moluccana</i>, <i>Eucalyptus tereticornis</i> Mid stratum species: <i>Bursaria spinosa</i> Ground stratum species: <i>Dichondra repens</i>, <i>Vittadinia cuneata</i>, <i>Einadia nutans</i>, <i>Atriplex semibaccata</i>, <i>Rytidosperma fulvum</i>, <i>Chloris ventricosa</i>, <i>Microlaena stipoides</i>, <i>Glycine tabacina</i>, <i>Glycine clandestina</i>

Table 4.3 provides a summary of the PCTs occurring within the Development Site, including vegetation formation, percent cleared within the Hawkesbury/Nepean catchment and extent within the Development Site. The distribution of these PCTs within the Development Site is shown in **Figure 4.1**.

Table 4.3 Summary of PCTs occurring within the Development Site

PCT Code	PCT Name	Vegetation Formation	Vegetation Class	% Cleared within Catchment	Area within Development Site (ha)
HN526	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Grassy Woodlands	Coastal Valley Grassy Woodlands	95	0.33
HN528	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Grassy Woodlands	Coastal Valley Grassy Woodlands	95	0.41

The area of *Typha orientalis* (Broadleaf Cumbungi) that occurs around the fringe of the brick pit dam (**Photographs 4.3** and **4.4**) does not constitute a naturally occurring native vegetation community and does not conform to any approved PCT (including PCTs representing derived or secondary communities). The *Typha orientalis* most likely opportunistically established around the dam and could possibly have been introduced from nearby native vegetation (Eastern Creek flows to the east of the dam and an inlet pipe carries runoff from around Austral Bricks land into the dam).

The planted trees and shrubs established on top of a constructed bund (**Photographs 4.5** and **4.6**) include the following species:

- *Allocasuarina littoralis* (Black She-oak);
- *Eucalyptus sideroxylon* (Mugga Ironbark);
- *Acacia parramattensis* (Parramatta Wattle);
- *Eucalyptus tereticornis* (Forest Red Gum); and
- *Callistemon citrinus* (Crimson Bottlebrush) or cultivar.

The understorey appears to have been seeded with exotic grass species commonly used in stabilising bunds and stockpiles, including *Pennisetum clandestinum* (Kikuyu) and *Chloris gayana* (Rhodes Grass). *Chrysanthemoides monilifera* ssp. *rotunda* (Bitou Bush) was also recorded.

These areas do not require further assessment unless it provides habitat for species credit species.



Photograph 4.3 Broadleaf Cumbungi (*Typha orientalis*) fringing a dam



Photograph 4.4 Habitat of fringing Broadleaf Cumbungi (*Typha orientalis*); inlet pipe location indicated by red arrow



Photograph 4.5 Planted trees and shrubs on constructed bund



Photograph 4.6 Plantings on constructed bund evidenced by the yellow tree guards

4.4.1 Threatened Ecological Communities

Both PCTs identified within the Development Site are associated with a Threatened Ecological Community (TEC) according to the VIS Classification Database as shown in **Table 4.4**.

The subsequent assessment of each of the PCTs is based on the assessment of the associated TECs as shown in **Table 4.4**.

The distribution of TECs within the Development Site is shown in **Figure 4.2**.

Table 4.4 TECs associated with PCTs occurring within the Development Site

PCT Code	PCT Name	TEC Name	TEC Status	Assessed as Associated TEC?
HN526	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered	Yes
HN528	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 HN528 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 HN528 within the Development Site, it 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 HN528 at 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	Minimum patch size is ≥ 0.5 ha; AND $\geq 50\%$ of the perennial understorey vegetation cover is made up of native species	The patch size at the Development Site is 0.41 ha. Less than 50% of the perennial understorey vegetation cover is made up of native species.

Table 4.5 Evaluation of HN528 at Development Site against EPBC Act listing advice thresholds

Category and Rationale	Threshold	Development Site details
size applied in NSW.		
OR		
Larger patches which are inherently valuable due to their rarity.	The patch size is ≥ 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 0.41 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 ≥ 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 ≥ 5 ha in area.	The patch size at the Development Site is 0.41 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 ≥ 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 ≥ 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 (≥ 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 0.41 ha. Less than 30% of the perennial understorey vegetation cover is made up of native species. The patch DOES NOT have at least one tree with hollows per hectare or at least one large tree (≥ 80 cm dbh) per hectare from the upper tree layer species

4.4.2 Description of Plant Community Types within the Development Site

- i. HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin

HN526 occurs in a few locations within the Development Site and is associated with the riparian zone of Eastern Creek (which flows to the north along the western edge of Austral Bricks land). A representative photograph of this PCT is shown in **Photographs 4.7 to 4.9**.

This PCT is suffering from edge impacts from the adjoining operational areas. In some areas, the PCT has been historically modified by earthworks for bund construction and has subsequently undergone canopy regeneration.

The upper stratum is dominated by remnant and regrowth *Eucalyptus tereticornis* (Forest Red Gum). Other species present within the upper stratum include *Eucalyptus moluccana* (Grey Box). A small tree layer is present in areas consisting of younger individuals of the upper stratum species and *Casuarina glauca* (Swamp She-oak). In the patch to the north that is closest to Eastern Creek, *Melaleuca decora* is also present.

The understorey is degraded by a number of environmental weeds, including *Asparagus asparagoides* (Bridal Creeper) and *Araujia sericifera* (Moth Vine). The patch to the north that is closest to Eastern Creek is highly impacted by invasion of noxious woody weeds including *Olea europaea* ssp. *cuspidata* (African Olive) and *Lantana camara* (Lantana).

The shrub stratum is largely absent from all areas of HN526 within the Development Site but does include one or two individuals of *Bursaria spinosa* (Blackthorn) and *Dillwynia sieberi* (Prickly Parrot-pea).

The ground stratum is largely exotic and is dominated by a number of perennial exotic grasses, including *Pennisetum clandestinum* (Kikuyu), *Cynodon dactylon* (Couch Grass), *Chloris gayana* (Rhodes Grass) and *Eragrostis curvula* (African Love-grass). The ground stratum has large occurrences of exotic herbs, including *Senecio madagascariensis* (Fireweed), *Hypochaeris radicata* (Catsear), *Plantago lanceolata* (Lamb's Tongue) and *Sonchus oleraceus* (Common Sowthistle).

Within the patch to the north that is closest to Eastern Creek, some native groundcover species are present in reasonable abundance but are currently impacted by exotic perennial groundcovers. These species include *Brunoniella australis* (Blue Trumpet), *Dichondra repens* (Kidney Weed), *Microlaena stipoides* (Weeping Meadow Grass) and *Clematis glycinoides* (Headache Vine). In the remainder of the Development Site, the native component of the groundcover is almost absent; only rare occurrences of native species were recorded, including *Bothriochloa macra* (Red-leg Grass), *Aristida vagans* (Threeawn Speargrass), *Dichondra repens* (Kidney Weed) and *Chamaesyce drummondii* (Caustic Weed).



Photograph 4.7 HN526 in the south eastern portion of the Development Site (note Kikuyu understorey, topsoil disturbance and canopy age)



Photograph 4.8 HN526 in the north western portion of the Development Site (note African Olive in midground)



Photograph 4.9 HN526 in the centre of the Development Site near the dam

ii. *HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin*

HN528 occurs within the south eastern corner of the Development Site as an isolated patch. A representative photograph of this PCT is shown in **Photograph 4.10**. This PCT is suffering from edge impacts from the adjoining operational areas. The PCT has been historically modified by earthworks for bund construction and has subsequently undergone canopy regeneration.

The upper stratum is dominated by remnant and regrowth *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Red Gum). A small tree layer is present in areas consisting of younger individuals of the upper stratum species. The understorey is degraded by a number of environmental weeds, including *Asparagus asparagoides* (Bridal Creeper) and *Araujia sericifera* (Moth Vine). A native shrub layer is mostly absent, with *Bursaria spinosa* (Blackthorn) occurring at low abundances along with a small number of the exotic *Lycium ferocissimum* (African Boxthorn).

The ground stratum is largely exotic and is dominated by a number of perennial exotic grasses, including *Pennisetum clandestinum* (Kikuyu), *Cynodon dactylon* (Couch Grass), *Chloris gayana* (Rhodes Grass) and *Eragrostis curvula* (African Love-grass). The ground stratum has large occurrences of exotic herbs, including *Senecio madagascariensis* (Fireweed), *Hypochaeris radicata* (Catsear), *Plantago lanceolata* (Lamb's Tongue) and *Sonchus oleraceus* (Common Sowthistle). The native component of the groundcover is almost absent; only rare occurrences of native species were recorded, including *Bothriochloa macra* (Red-leg Grass), *Aristida vagans* (Threeawn Speargrass), *Dichondra repens* (Kidney Weed) and *Atriplex semibaccata* (Creeping Saltbush).



Photograph 4.10 HN528 within the Development Site (left: constructed bund; right: edge of haul road)

4.5 Vegetation Zones

The two PCTs occurring within the Development Site were stratified into areas by condition. HN526 was separated into two vegetation zones, on the basis of the dominance versus lack of native vegetation in the understorey. HN528 was assessed as being within one broad condition state. Thus, three vegetation zones were identified within the Development Site.

A summary of the vegetation zones within the Development Site is provided in **Table 4.6** and their distribution is shown in **Figure 4.3**.

Each vegetation zone was assessed using plot and transect surveys or full floristic surveys to determine the site value score. The locations of these plots are shown in **Figure 4.4**. Plot and 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 ≥ 17 and therefore must be further assessed.

Table 4.6 Vegetation zones within the Development Site

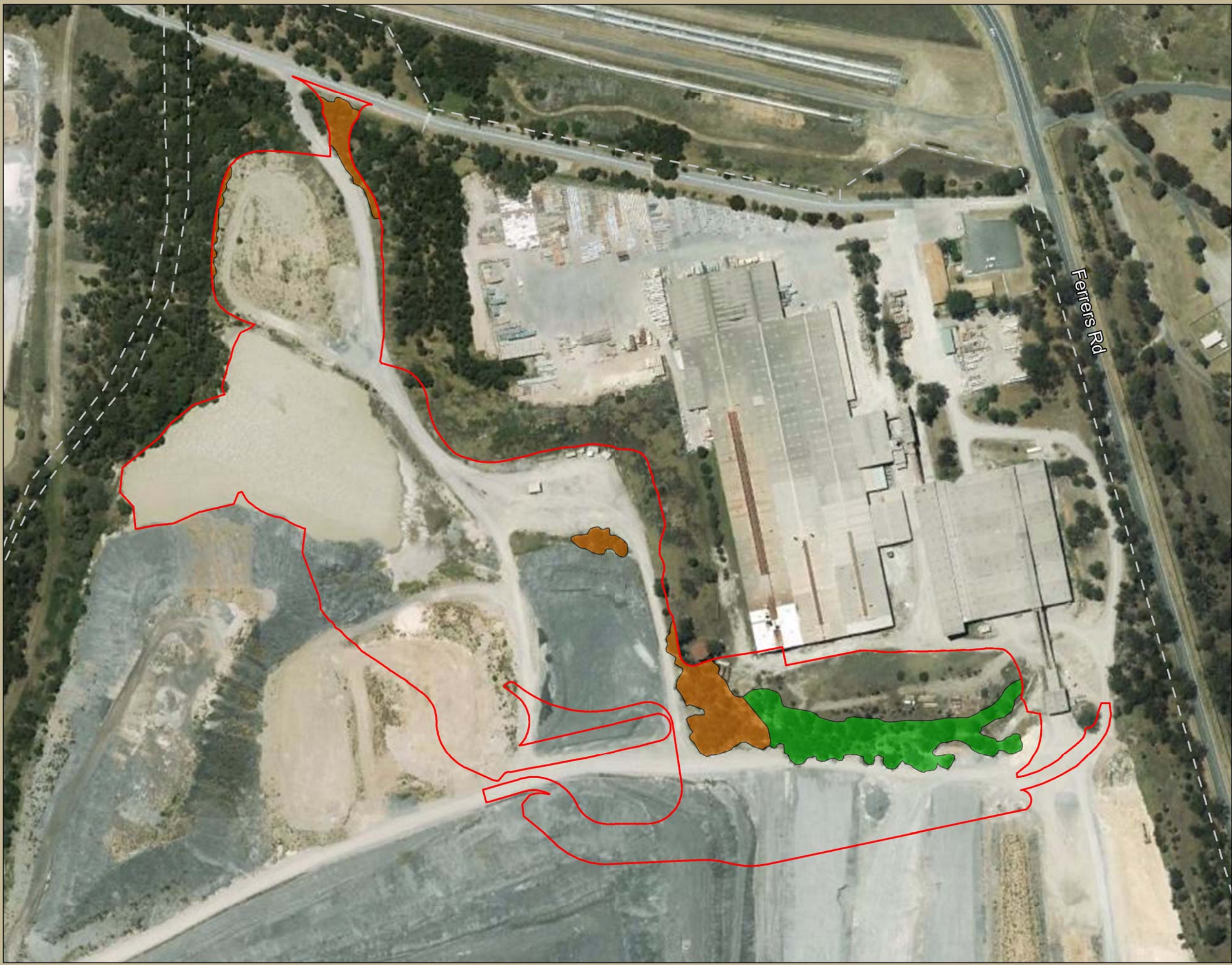
Zone	PCT	Condition Class	Area (ha)	Site Value Score
1	HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Mode rate to good	0.09	36.63
2	HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Moderate to good _Poor	0.24	33.16
3	HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	Moderate to good	0.41	38.89

4.6 Groundwater Dependent Ecosystems

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

One GDE was identified within the Development Site as Cumberland River Flat Forest, which corresponds to the PCT HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin previously identified within **Section 4.5**.

The impacts to HN526 within the Development Site will be assessed in **Chapter 7**.



Legend

Development Site

Lot Boundary

PCT

Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)

Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528)

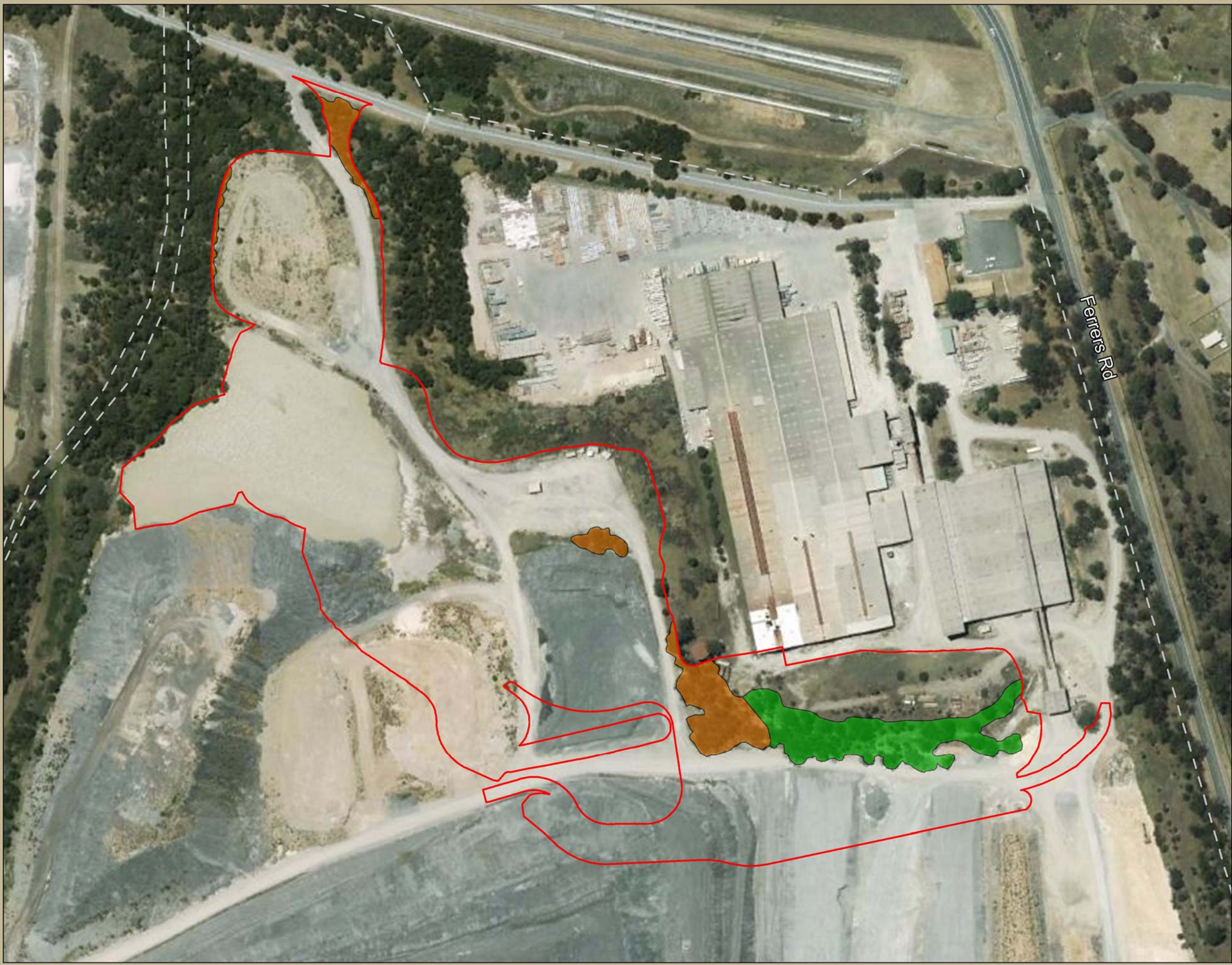
Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
© 2015 NSW Land and Property
Management Authority,
SIX Viewer



Figure 4.1. PCTs within the Development Site





Legend

- Development Site
- Lot Boundary

TEC

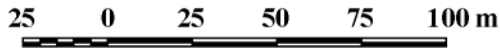
- River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
- Cumberland Plain Woodland in the Sydney Basin Bioregion

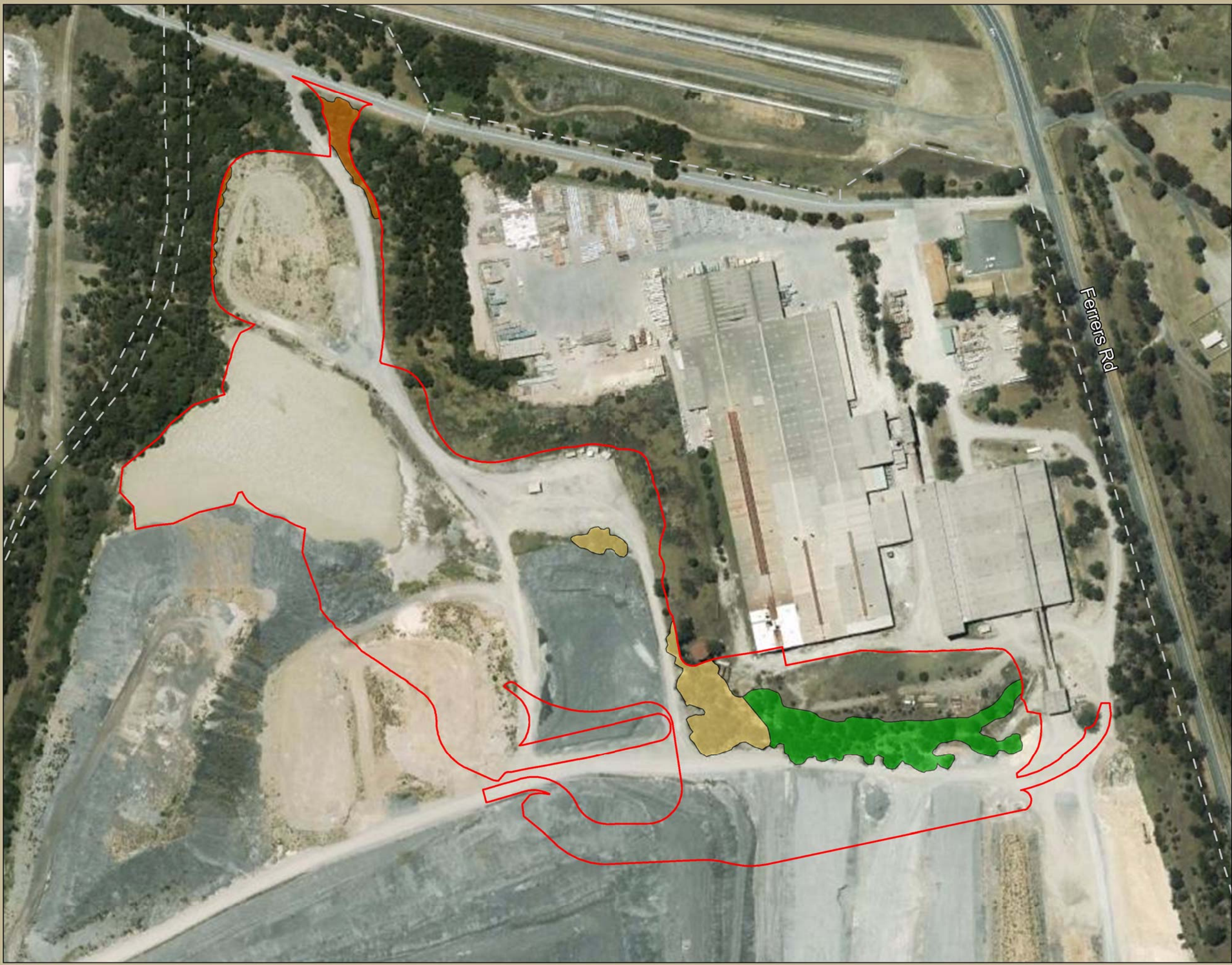
Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
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Management Authority,
SIX Viewer



Figure 4.2. TECs within the Development Site





Legend

Development Site

Lot Boundary

Vegetation Zone

Zone 1: HN526 (Mod/Good)

Zone 2: HN526 (Mod/Good_Poor)

Zone 3: HN528 (Mod/Good)

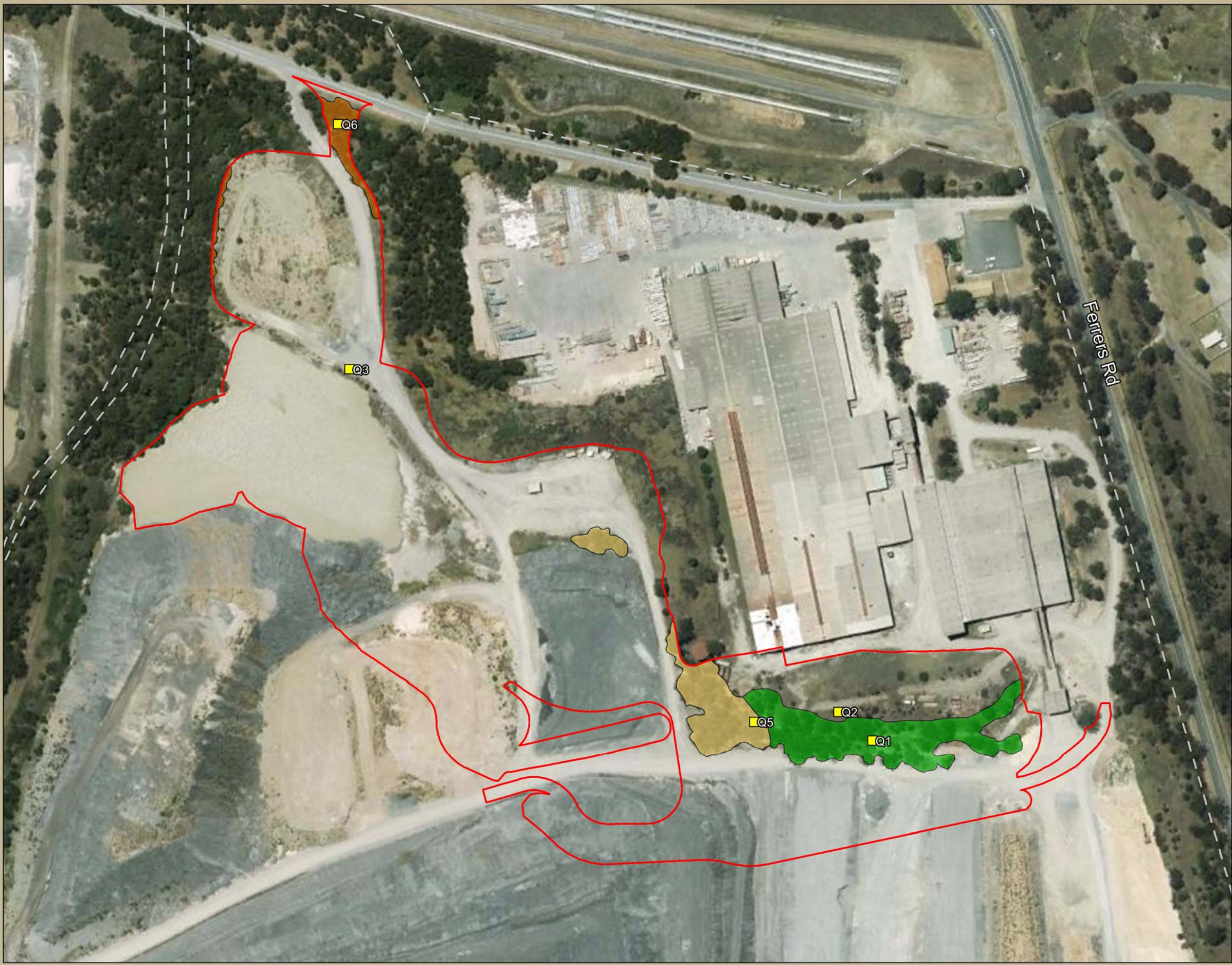
Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
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SIX Viewer



Figure 4.3. Vegetation zones within the Development Site





Legend

- Development Site
- Lot Boundary
- Flora Plot Location *

Vegetation Zone

- Zone 1: HN526 (Mod/Good)
- Zone 2: HN526 (Mod/Good_Poor)
- Zone 3: HN528 (Mod/Good)

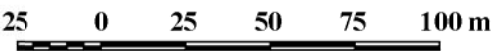
* Flora Plot Q2 and Q3 were sampled in areas not conforming to PCTs.

Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
© 2015 NSW Land and Property
Management Authority,
SIX Viewer



Figure 4.4. Plot and transect locations within the Development Site



Threatened Species and Populations

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 Austral Bricks land:

- Flora and fauna assessment of the Development Site and Austral Bricks land undertaken by Travers Bushfire and Ecology (Sheather-Reid et al. 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 fauna habitat assessment was undertaken within the site by Travers Bushfire and Ecology (Sheather-Reid et al. 2015) on the 12 March 2015. Fauna habitat assessments included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows and fallen logs. 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

Travers Bushfire and Ecology (Sheather-Reid et al. 2015) undertook random meander searches on the 10 March 2015 to identify flora occurring on site and develop a broad species list.

A review of the OEH Atlas of NSW Wildlife (OEH 2015) 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.

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

Further surveys for threatened flora were undertaken by Cumberland Ecology on the 20 October 2015. 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**).

ii. Fauna

Travers Bushfire and Ecology (Sheather-Reid et al. 2015) conducted the following targeted threatened fauna surveys within the Development Site and adjoining land on the 12 March 2015 for candidate species credit species:

- Green and Golden Bell Frog (*Litoria aurea*) and other amphibian surveys;
- Cumberland Plain Land Snail (*Meridolum corneovirens*) surveys; and
- Regent Honeyeater (*Anthochaera phrygia*) and other bird surveys.

In addition to the targeted searches, Travers Bushfire and Ecology (Sheather-Reid et al. 2015) also undertook the following general surveys on the 12 March 2015 as part of the Flora and Fauna Assessment of the Austral Bricks land:

- Microchiropteran bat surveys;
- Spotlighting and call playback;
- Habitat searches; and
- Incidental observations.

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

a. Green and Golden Bell Frog and Other Amphibian Surveys

Travers Bushfire and Ecology (Sheather-Reid et al. 2015) 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.

Travers Bushfire and Ecology (Sheather-Reid et al. 2015) noted that potential frog sites were visited at night. Calling frogs were noted and non-calling frogs were detected visually using torches. 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.

b. Cumberland Plain Land Snail surveys

Habitat searches were undertaken by Travers Bushfire and Ecology (Sheather-Reid et al. 2015) along Cumberland Plain Woodland regrowth strips. Areas of dense leaf litter with likely moisture retaining properties were scraped using a three pronged rake. Logs stumps, artificial refuse and rocks were also turned over.

c. Regent Honeyeater and other bird surveys

Visual observation and call identification of diurnal birds was carried out by Travers Bushfire and Ecology (Sheather-Reid et al. 2015) during survey periods within Development Site. Six (6) diurnal bird census points were surveyed with and a minimum of 15 minutes survey effort spent at each census point. Diurnal birds were also identified and recorded as they were encountered throughout the Development Site during all other surveys.

d. Microchiropteran Bat Surveys

Ultrasonic call detection surveys for microchiropteran bats were undertaken within the Austral Bricks land by Travers Bushfire and Ecology (Sheather-Reid et al. 2015). Anabat units were positioned in suitable habitat, such as along tracks and near watercourses for target species. The Anabat units were set up and activated before dusk for several hours. 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.

f. Survey Effort

Fauna survey methods and survey effort undertaken by Travers Bushfire and Ecology (Sheather-Reid et al. 2015) are summarised in **Table 5.1**.

Table 5.1 Fauna survey effort (from Travers Bushfire and Ecology report[^])

Fauna group	Date	Weather conditions	Survey technique(s)	Survey effort / time (24hr)
Diurnal birds	12/03/ 2015	4/8 cloud, light NE wind, no rain, temp 29°C	Diurnal opportunistic	4hrs 1545 - 1945
Nocturnal birds	12/03/ 2015	4/8 cloud, light-mod SE wind, no rain, temp 24-22°C	Spotlighting	1hr 20min 1945 - 2105
Arboreal mammals	12/03/ 2015	4/8 cloud, light-mod SE wind, no rain, temp 24-22°C	Spotlighting	1hr 20min 1945 - 2105
Terrestrial mammals	12/03/ 2015	4/8 cloud, light-mod SE wind, no rain, temp 24-22°C	Spotlighting	1hr 20min 1945 - 2105

Table 5.1 Fauna survey effort (from Travers Bushfire and Ecology report[^])

Fauna group	Date	Weather conditions	Survey technique(s)	Survey effort / time (24hr)
Bats	12/03/ 2015	4/8 cloud, light-mod SE wind, no rain, temp 24-22°C	Spotlighting	1hr 20min 1945 - 2105
			Anabat II & SD-1 (Passive monitoring) x2	2hr 40min 1945 - 2105
Reptiles	12/03/ 2015	4/8 cloud, light NE wind, no rain, temp 29°C	Habitat search, opportunistic	4hrs 1545 - 1945
Amphibians	12/03/ 2015	4/8 cloud, light-mod SE wind, no rain, temp 24-22°C	Spotlighting & call identification	1hr 20min 1945 - 2105
			Call-playback (Green and Golden Bell Frog)	Commenced @ 2000
Molluscs	12/03/ 2015	4/8 cloud, light NE wind, no rain, temp 29°C	Habitat searches	2 hours 1545 - 1945

[^](Sheather-Reid et al. 2015)

5.2.3 Survey Limitations

The majority of the Development Site is highly disturbed by past activities, including under-scrubbing, cut and fill works and tree clearing. As discussed in **Section 5.3**, the site supports very poor examples of fauna habitat. It is likely that the surveys undertaken by Travers Bushfire and Ecology (Sheather-Reid et al. 2015) and subsequent survey by Cumberland Ecology is adequate to obtain a reasonably 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 under-scrubbing, cut and fill works and tree clearing. As a result most of the habitat available to native species is degraded and unsuitable.

5.3.1 Woodland Habitat

Woodland habitat occurs along the eastern and southern boundaries of the Austral Bricks land and in the north-western portion of the Austral Bricks land around the existing watercourses. There is also a small patch around the mill area, which occurs as a result of regrowth. The condition of this habitat varies across the site with some areas existing as canopy only woodland (see photographs in **Chapter 4**). South of the mill along the eastern boundary, there is understorey vegetation present. Weed infestation is prominent throughout most of the woodland areas.

The majority of trees within the Development Site are young and do not contain hollows. The site also has a low number of fallen trees and branches. No natural rock habitat features are present.

Limited foraging habitat does occur within the Development Site and include blossom and nectar resources from canopy and shrub species, including:

- *Eucalyptus tereticornis* (Forest Red Gum);
- *Eucalyptus moluccana* (Grey Box);
- *Acacia parramattensis* (Parramatta Wattle);
- *Eucalyptus sideroxylon* (Red Ironbark); and
- *Callistemon citrinus* (Crimson Bottlebrush).

5.3.2 Aquatic Habitat

The Eastern Creek watercourse is a disturbed creekline that is highly infested with dense lantana (*Lantana camara*) and exotic vine species. It may provide habitat for invertebrates, fish species, amphibians, reptiles and water birds. It occurs outside of the Development Site but within the wider Austral Bricks land.

The only aquatic habitat present within the Development Site is the large dam on the western boundary of the Development Site (see photographs in **Chapter 4**). It is characterised by fringing vegetation of *Typha orientalis* and receives run off from the site through an inlet pipe at the southern end of the dam. For this reason, the water is highly turbid.

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 5.2** lists the predicted ecosystem credit species for the Development Site, which has been based on the following:

- IBRA subregion: Cumberland;
- Associated PCTs: HN526 and HN528;
- Percent native vegetation in outer assessment circle: 26-30%;
- Condition of vegetation: moderate to good (all vegetation zones);
- Patch size: >1000 ha; and
- Credit type: Ecosystem.

For all vegetation zones within the Development Site, the Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*) and Powerful Owl (*Ninox strenua*) are the ecosystem credit species with the lowest Tg values. No additional assessment of habitat components for the predicted ecosystem credit species has been undertaken for this assessment.

Table 5.2 Predicted ecosystem credit species

Scientific Name	Common Name	Tg Value	Predicted within PCT?	
			HN526	HN528
<i>Ninox connivens</i>	Barking Owl	0.325	Y	Y
<i>Melithreptus gularis subsp. gularis</i>	Black-chinned Honeyeater (eastern subspecies)	0.75	Y	Y
<i>Climacteris picumnus subsp. victoriae</i>	Brown Treecreeper (eastern subspecies)	0.5	Y	Y
<i>Burhinus grallarius</i>	Bush Stone-curlew	0.375	Y	Y
<i>Stagonopleura guttata</i>	Diamond Firetail	0.75	Y	Y
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	0.45	Y	Y
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	0.45	Y	Y
<i>Petroica phoenicea</i>	Flame Robin	0.75	Y	Y
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	0.5	Y	Y
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	0.45	Y	Y
<i>Melanodryas cucullata subsp. cucullata</i>	Hooded Robin (south-eastern form)	0.6	Y	Y
<i>Hieraaetus morphnoides</i>	Little Eagle	0.725	Y	Y
<i>Glossopsitta pusilla</i>	Little Lorikeet	0.575	Y	Y
<i>Tyto novaehollandiae</i>	Masked Owl	0.325	Y	Y
<i>Grantiella picta</i>	Painted Honeyeater	0.75	Y	Y
<i>Ninox strenua</i>	Powerful Owl	0.325	Y	Y
<i>Petroica boodang</i>	Scarlet Robin	0.75	Y	Y
<i>Chthonicola sagittata</i>	Speckled Warbler	0.375	Y	N

Table 5.2 Predicted ecosystem credit species

Scientific Name	Common Name	Tg Value	Predicted within PCT?	
			HN526	HN528
<i>Circus assimilis</i>	Spotted Harrier	0.725	Y	Y
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	0.375	Y	Y
<i>Lophoictinia isura</i>	Square-tailed Kite	0.725	Y	Y
<i>Lathamus discolor</i>	Swift Parrot	0.75	Y	Y
<i>Neophema pulchella</i>	Turquoise Parrot	0.55	Y	Y
<i>Daphoenositta chrysoptera</i>	Varied Sittella	0.75	Y	Y
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	0.45	Y	Y

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:

- Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation or emergent aquatic vegetation;
- Land within 100 m of emergent aquatic or riparian vegetation;
- Wet and damp areas only;
- Land containing bark or leaf litter accumulation;
- Alluvial soils; and
- Periodically waterlogged sites (including table drains and farm dams).

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**. This includes 18 flora species or populations and 9 fauna species.

Eucalyptus scoparia (Wallangarra White Gum) is a species credit species that was recorded by Travers Bushfire and Ecology (Sheather-Reid et al. 2015) within the Lot boundaries. The natural geographic distribution of this species within NSW is known to be only three locations near Tenterfield, including Bald Rock National Park. This species is available commercially from nurseries and is used in gardens and landscaping around Sydney. In accordance with Section 6.5 from the FBA, this species is not assessed further.

5.5.2 Candidate Species for Further Assessment

Table 5.3 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:

- Flora Species:
 - *Acacia pubescens*;
 - *Cynanchum elegans*;

- *Dillwynia tenuifolia*;
- *Grevillea juniperina* subsp. *juniperina*;
- *Marsdenia viridiflora* – endangered population;
- *Persicaria elatior*;
- *Pilularia novae-hollandiae*; and
- *Pimelea spicata*;

➤ Fauna Species:

- Regent Honeyeater;
- Green and Golden Bell Frog; and
- Cumberland Plain Land Snail.

These species credit species were subject to the targeted surveys as described in **Section 5.2**. The locations of surveys are shown in **Figure 5.1**.

Table 5.3 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?
Flora				
<i>Acacia bynoeana</i>	Bynoe's Wattle	Occurs in heath or dry sclerophyll forest on sandy soils. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Unlikely to occur. No sandy soil and/or associated overstorey species present. No records of the species within a 10 km radius of the Development Site.	No
<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. 51 records of the species within a 10 km radius of the Development Site.	Yes
<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 Honeymyrtle scrub to open scrub.	Potential to occur. Woodland containing Forest Red Gums is present although it is noted that there are no records within a 10 km radius of the development.	Yes

Table 5.3 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?
<i>Dillwynia tenuifolia</i>	Dillwynia tenuifolia	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 areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Moderate potential habitat along southern and eastern Austral Bricks land boundaries but low likelihood within the Development Site.	Yes
<i>Dillwynia tenuifolia</i> - endangered population Kems Creek	Dillwynia tenuifolia (a shrub) population, Kems Creek	Occurs on a small outlier of the Berkshire Park Soil Landscape. The site supports a transition from Castlereagh Ironbark Forest to Castlereagh Scribbly Gum Woodland. Portions of the site contain a form of Shale Gravel Transition Forest	Unlikely to occur. Unsuitable habitat and there are no records within a 10 km radius of the development.	No
<i>Eucalyptus benthamii</i>	Camden White Gum	Occurs on the alluvial flats of the Nepean River and its tributaries. Requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment. Associated canopy species include <i>Eucalyptus elata</i> , <i>E. baueriana</i> , <i>E. amplifolia</i> , <i>E. deanei</i> , <i>Angophora subvelutina</i> , <i>E. crebra</i> , <i>E. deanei</i> , and <i>E. punctata</i> .	Unlikely to occur. Unsuitable habitat and there are no records within a 10 km radius of the development.	No

Table 5.3 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?
<i>Grevillea juniperina</i> <i>subsp. juniperina</i>	Juniper-leaved Grevillea	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels. Recorded from Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest.	Potential to occur. Suitable habitat available although the Austral Bricks land is centred approximately 5km away from the main extant of the species distribution.	Yes
<i>Hibbertia</i> sp. Bankstown	Hibbertia sp. Bankstown	Remnant vegetation at the known location (Bankstown Airport) and soil type (silty sandy alluvium) are consistent with an inferred pre-settlement cover of Castlereagh Ironbark Forest although some remnant vegetation at and near the site (along the channel in particular) suggests Castlereagh Scribbly Gum equally valid.	Unlikely to occur. Unsuitable habitat and there are no records within a 10 km radius of the development.	No
<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 riparian areas.	No

Table 5.3 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?
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Marsdenia viridiflora subsp. viridiflora in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Grows in vine thickets and open shale woodland.	Potential to occur, although there are no records within a 10 km radius of the development and the understorey of woodland areas are very poor.	Yes
<i>Persicaria elatior</i>	Tall Knotweed	Grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Potential to occur. Damp places in creek lines in are present. No records of the species within a 10 km radius of the Development Site.	Yes
<i>Persoonia bargoensis</i>	Bargo Geebung	Occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils of the Wianamatta Shale and .Hawkesbury Sandstone.	Unlikely to occur. Unsuitable habitat and there are no records within a 10 km radius of the development.	No
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	Periodically waterlogged sites (including table drains). Grows in shallow swamps and waterways, often among grasses and sedges.	Potential to occur. Suitable habitat present within a first order stream within the Development Site. No recent records of the species within a 10 km radius of the Development Site.	Yes

Table 5.3 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?
<i>Pimelea curviflora</i> var. <i>curviflora</i>	Pimelea curviflora var. curviflora	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Unlikely to occur. Unsuitable habitat and there are no records within a 10 km radius of the development.	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. 21 records of the species within a 10 km radius of the Development Site.	Yes
<i>Pomaderris brunnea</i>	Brown Pomaderris	Grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Unlikely to occur. Unsuitable habitat and there are no records within a 10 km radius of the development.	No
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	Typically in shallow /skeletal soils on rock shelves and platforms. The vegetation communities above the shelves where Pterostylis saxicola 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

Table 5.3 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?
Fauna				
<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. Occurrences of <i>E. robusta</i> , <i>E. punctata</i> and <i>E. moluccana</i> may provide habitat for this species. No recent records of the species within a 10 km radius of the Development Site.	Yes
<i>Callocephalon fimbriatum</i> population in the Hornsby and Ku-ring-gai Local Government Areas	Gang-gang Cockatoo population, Hornsby and Ku-ring-gai Local Government Areas	Occurs within a variety of forest and woodland types. Usually frequents forested areas with old growth attributes required for nesting and roosting purposes. Requires hollows with diameter ≥ 10 cm and >9 m above the ground in eucalypts	Unlikely to occur. Limited suitable habitat present. No records of the species within a 10 km radius of the Development Site.	No

Table 5.3 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?
<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>Ixobrychus flavicollis</i>	Black Bittern	Associated PCTs bordering water bodies or watercourses. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. During the day, roosts in trees or on the ground amongst dense reeds.	Unlikely to occur. Unsuitable habitat and there are no records within a 10 km radius of the development.	No

Table 5.3 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?
<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.	Potential to occur. Riparian vegetation located along Eastern Creek. 9 records of the species within a 10 km radius of the Development Site.	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.	Likely to occur as suitable habitat is available. One empty shell has been recorded within the site by Travers bushfire and ecology. 158 records within a 10km radius of the site.	Yes

Table 5.3 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?
<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. No suitable hollow bearing trees are available. No records of the species 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 two primary feed trees occur within the Development Site (<i>Eucalyptus tereticornis</i> and <i>E. amplifolia</i>), the habitat is significantly fragmented from any nearby connecting habitat. There are no records of the species within a 10 km radius of the Development Site.	No

5.5.3 Presence of Candidate Species

Table 5.4 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.

Travers Bushfire and Ecology (Sheather-Reid et al. 2015) recorded the Cumberland Plain Land Snail within woodland on the eastern boundary of the Austral Bricks land but no individuals were recorded within the Development Site despite detailed targeted surveys.

Thus, no species credit species were recorded during surveys of the Development Site and as such, no further assessment of species credit species has been undertaken.

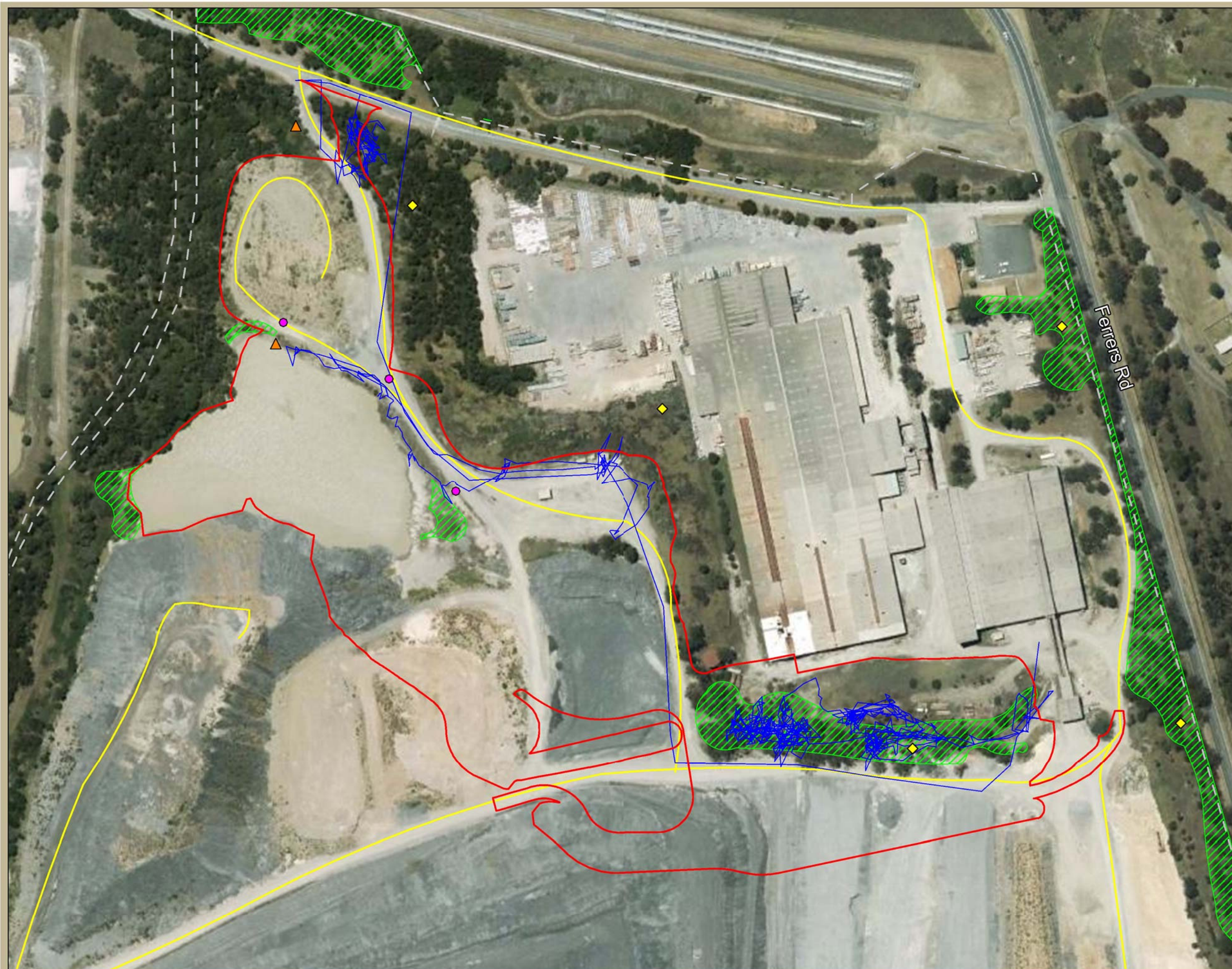
A list of flora and fauna species recorded during surveys is provided in **Appendix B** and **Appendix C**, respectively.

Table 5.4 Summary of surveys undertaken for candidate species credit species

Scientific Name	Common Name	Survey Type	Survey Timing
Flora			
<i>Acacia pubescens</i>	Downy Wattle	Random meanders in woodland	10 March 2015 and 20 October 2015
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Random meanders in woodland	10 March 2015 and 20 October 2015
<i>Dillwynia tenuifolia</i>	Dillwynia tenuifolia	Random meanders in woodland	10 March 2015 and 20 October 2015
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Juniper-leaved Grevillea	Random meanders in woodland	10 March 2015 and 20 October 2015
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Marsdenia viridiflora subsp. <i>viridiflora</i> in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Random meanders in woodland	10 March 2015 and 20 October 2015
<i>Persicaria elatior</i>	Tall Knotweed	Random meanders in woodland	12 March 2015 and 20 October 2015
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	Random meanders in woodland	10 March 2015 and 20 October 2015
<i>Pimelea spicata</i>	Spiked Rice-flower	Random meanders in woodland	10 March 2015 and 20 October 2015

Table 5.4 Summary of surveys undertaken for candidate species credit species

Scientific Name	Common Name	Survey Type	Survey Timing
Fauna			
<i>Anthochaera phrygia</i>	Regent Honeyeater	Targeted diurnal bird surveys in woodland habitats	12 March 2015
<i>Litoria aurea</i>	Green and Golden Bell Frog	Targeted spotlighting and call playback surveys in aquatic habitat	12 March 2015
<i>Meridolum corneovirens</i>	Cumberland Plains Land Snail	Targeted searches in woodland areas with deep leaf litter	12 March 2015

**Legend**

- Development Site
- Lot Boundary

Fauna Survey Locations

- Cumberland Plain Land Snail search
- Spotlighting Transect
- Green & Golden Bell Frog Call Playback
- ◆ Diurnal bird census
- ▲ Anabat

Flora Survey Locations

- Random Meander

Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
© 2015 NSW Land and Property
Management Authority,
SIX Viewer;
Travers Bushfire & Ecology (2015).
Flora & Fauna Assessment - 780
Wallgrove Road, Horsley Park.

cumberland
ecology

25 0 25 50 75 100 m

Figure 5.1. Targeted species credits species survey locations

Avoid and Minimise Impacts

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 a suite of mitigation measures.

6.1 Avoidance Measures

The proposed final Project footprint for development and operation (i.e. the Development Site) is shown in **Figure 1.3** and this demonstrates that the proposed Project has been located within land that has been extensively cleared and modified.

The Austral Bricks land has a long history of industrial/quarrying usage dating back to the earliest consents in the 1960s (McKenzie Group Consulting Planning 2015). Consequently it already contains infrastructure such as quarry roads, various earthworks and buildings. As shown within **Figure 1.3** the Project would be located in areas largely cleared for quarry roads and earthworks. The Development Site is also linked to and in close proximity to the roads and buildings in the north eastern side of the site for functional purposes.

Previous use of the Austral Bricks land has cleared much of the original vegetation, with the result that most remaining patches in the central and southern portions of the site are small, degraded and relatively isolated. Several minor and degraded patches of woodland occur within the Development Site and would be cleared, as indicated in **Figure 4.1**. Avoidance of such patches had not been considered feasible and retention of such vegetation would be of limited ecological value because of ongoing threats (particularly edge effects from erosion, weed invasion, etc) and because there is a low chance of restoring and regenerating habitat connectivity in the future due to the zoning of the Austral Bricks land.

The proposed Development Site boundary would not result in clearing or other losses of vegetated corridors on the Austral Bricks land. The most intact areas of TEC vegetation would therefore be retained. Vegetation along the corridor associated with Eastern Creek, strips of vegetation along Wallgrove Road, and strips of vegetation along the northern and south eastern boundaries of the Austral Bricks land have been avoided by the Project.

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 potential for indirect impacts to vegetation in a number of areas: vegetation along the eastern side of Eastern Creek, a patch of vegetation in the north (adjacent to the proposed road exit) and an area of vegetation along the eastern boundary of the Austral Bricks land at the Ferrers Road frontage (**Figure 6.1**). 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).

The Project will include a suite of measures designed to minimise the impacts on retained vegetation as set out in **Section 6.2** below.

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:

- Native vegetation to be retained that is in close proximity to the Development Site should be protected through a 1.8m high fence that is erected prior to demolition, construction and re-contouring of the landscape.
- Sediment and erosion control measures are to be installed immediately prior to the commencement of demolition, construction and earthworks.

Construction phase:

- Sediments are to be effectively retained within the site to minimise deterioration water quality during the construction works.
- Sediment deposition and water quality (Routine Environmental Nutrients and turbidity) is to be monitored before, during and after development to ensure that surface water quality is maintained to acceptable receiving water standards within Eastern Creek.
- Eastern Creek (watercourse 1):

- Protect the watercourse from all proposed works within 20m of the top of bank;
 - Undertake target weed removal and regeneration within Eastern Creek immediately adjacent to the proposed works;
 - Stabilise overland flows from the existing basins into the creek (currently directed over a vegetated embankment);
 - Filter all runoff through wetland beds or sedge filter zones; and
 - Undertake restoration revegetation works to expand the width of the riparian corridor to compensate for any perceived loss in the 'riparian protection zone'.
- Unnamed watercourse (watercourse 2) – first order stream – 10m from top of bank:
- Declassify as a watercourse to drainage line;
 - Provide a recreated watercourse with a minimum 10m fully vegetated riparian protection zone;
 - Remove fill, stabilise and revegetate with Swamp Oak Forest and or reconstruction of wetland and frog habitat; and
 - Stabilise the channels and discharge point into Eastern Creek.

Post construction phase:

- Loss of vegetation compensated by the planting of River-flat Eucalypt Forest vegetation along the remaining degraded western fringes of the site adjacent to Eastern Creek and the planting of Cumberland Plain Woodland vegetation along the remaining degraded eastern fringes of the site. Revegetation will enhance these areas to provide north-south connectivity as well as replace foraging trees for birds and bats. A 0.5 ha rehabilitation area has been proposed in the north-western corner of the Austral Bricks land to compensate for the loss of habitat and existing vegetation caused by the proposal.
- Aim to filter any runoff through sedge planted filters to minimise deposition within Eastern creek of associated drainage lines.
- Target weed control should be undertaken across all retained vegetation, focussing upon invasive and noxious weed species.
- Undertaken survey for a monitor the utilisation for the site for any threatened frog species such as Green and Golden Bell Frog and if present provide alternative artificial habitat free from disturbance.

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 is 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 0.74 ha native vegetation	Most of the development area has been confined to existing cleared land and regrowth (91.5%). Loss of native vegetation has been minimised. Riparian buffers to protect drainage lines and creeks will be in place outside the development area.	Loss of native vegetation will be offset by acquiring and retiring biodiversity credits.	Sourcing of credits will be commenced once approval is obtained. Retirement of credits will occur according to FBA rules.	Property Owner
Reduction of very narrow connectivity link (7.1 m).	The two main north-south biodiversity corridors along Eastern Creek and around the Prospect Reservoir will not be affected by this Project. Two narrow corridors of disrupted woody vegetation (i.e. stepping stones) currently exist within the Austral Bricks land. One along the northern and eastern boundary (i.e. Ferrers Road) of the Lot, the other along the north-eastern boundary of the Development Site (Figure 6.1). The proposed development will slightly reduce the width of this last link from 7.1m to <5m.	No major 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	The majority of the Development Site comprises cleared land with some regrowth (91.5%), which provides heavily degraded and poor habitat for most fauna species. The condition and nature of the fauna habitats within the Development Site have been greatly altered by existing and historical land uses. The surveys show that the site provides habitat for highly mobile and common species (Sheather-Reid et al. 2015), which have adapted to the	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

Table 6.1 Summary of Direct Impacts

Impact	How it is Addressed	Outcome	Timing	Responsibility
	urban environment. The clearing of <1ha of native vegetation will result in loss of some habitat, including understorey vegetation, logs, woody debris, leaf litter and nectar-producing trees.			
Loss of tree hollows	It is assumed that one tree with one hollow will be removed. This hollow is located within the transect area of Q6 within the northern tip of the development site (Figure 4.4). No other hollow-bearing trees were observed during the site surveys.	The tree hollow to be removed is accounted for in the BioBanking site attribute data of Q6 (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	Both vegetation communities proposed to be cleared are, while threatened, also highly degraded and consist of mostly canopy species.	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 Travers Bushfire and Ecology (Sheather-Reid et al. 2015) one listed fauna species was observed within the Development Site: the Grey-headed Flying-fox. Six threatened fauna species have potential habitat on the Development Site, all of which are highly mobile species (i.e. birds and bats), which are likely to use the site as part of their foraging home range. The report concludes that the potential impact on these	Foraging habitat for the Grey-headed Flying-fox is included in the FBA calculations. The purchase of biodiversity credits includes a "compensation" for this direct impact.	Same as above.	Property Owner

Table 6.1 **Summary of Direct Impacts**

Impact	How it is Addressed	Outcome	Timing	Responsibility
Loss of threatened flora species	species is insignificant. 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

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 Austral Bricks 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 clearing activities during construction.
Degradation of aquatic habitats	Potentially caused by changes in runoff, redirection of flows, influences to groundwater, infiltration, pollution and erosion. May influence downstream habitats.	Project will not directly impact Eastern Creek and will remove one drainage line that has already been modified extensively by quarrying activities.
Impacts on fish passage	No impacts to fish passage	N/A
Edge effects and weed invasion	Vehicles and plant may transport weed propagules into the Austral Bricks land. Creation of new edges will increase fragmentation and vulnerability of native vegetation to weed incursions	New edges where proposal will adjoin woodland vegetation in the west and north may experience additional edge effects.
Alteration to air quality and noise environments	May impact upon the roosting, breeding and foraging activities of locally occurring fauna.	Temporary and localised scale impacts during construction. Potential minor long term impacts during operation.



Legend

- Development Site
- Lot Boundary
- Potential Indirect Impact Zones

PCT (CE, 2015)

- Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)
- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528)

PCT (Travers, 2015)

- Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)
- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528)

Image Source:
Image © 2015 Aerometrex
(dated 01-01-2014)

Data Source:
Travers Bushfire & Ecology (2015).
Flora & Fauna Assessment - 780
Wallgrove Road, Horsley Park;
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Figure 6.1. Potential indirect impact zones

Impact Summary

7.1 Introduction

The Project will involve some direct and indirect impacts on native vegetation and fauna habitat, due to clearing of 0.74 ha of native vegetation and indirect effects of construction and operation of the proposed facilities.

The proposed development includes stockpiling of material, construction of a new rotary kiln and a screening plant, removal of existing stockpiles of material and ancillary site works. Existing assets, such as a primary crusher and extruder will be reused.

The Development Site comprises a total of 8.68 ha, which will impact on 0.74 ha of native vegetation to be cleared (i.e. 8.5%). The remaining development will be on previously cleared land and some exotic/native vegetation regrowth (i.e. 91.5%).

Riparian buffers will be in place to protect riparian vegetation outside the development area.

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 unavoidably remove 0.74 ha of native vegetation, which includes two vegetation communities; both listed under the *TSC Act* as TECs. Under the BioBanking methodology, vegetation polygons are not only separated by vegetation type, but also by quality, which results in three 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

Vegetation	TSC Act Status	EPBC Act Status	Area to be Removed (ha)	Ecosystem Credits
HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (Fully structured)	EEC	-	0.09	3

Table 7.1 Summary of Ecosystem Credits required

Vegetation	TSC Act Status	EPBC Act Status	Area to be Removed (ha)	Ecosystem Credits
HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (Canopy only)	EEC	-	0.24	7
HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (Canopy only)	CEEC	-	0.41	13
Cleared Land / Regrowth	-	-	7.94	N/A
Total land within Development Site			8.68	23

TSC Act / EPBC Act Status: EEC = endangered ecological community; CEEC = critically endangered ecological community

7.1.2 Direct Loss of Fauna Habitat

The BioBanking 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. All threatened species known or expected to occur within the Development Site are included in the ecosystem credits, i.e. no species credits require to be acquired for this proposed development. A summary of all direct impacts by the proposed development is provided in **Table 7.2** below.

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 with some regrowth (91.5%), 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 (Sheather-Reid et al. 2015), which have adapted to the urban environment. The clearing of 0.74 ha of native vegetation might result in loss of some habitat, such as:

- **Understorey vegetation** – loss of some shelter and foraging habitat for amphibians, reptiles, small birds and terrestrial mammals;
- **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;

- **Edge communities** – loss of foraging habitat for many species, particularly birds such as raptors; and
- **Ephemeral drainage lines** – loss of limited foraging, shelter and breeding habitat for amphibians, aquatic reptiles, wetland birds and aquatic mammals.

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 7.2** 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 7.1 and **7.2** show the location of these areas within the Development Site. A discussion of each of these components is provided below.

Table 7.2 **Thresholds for the assessment and offsetting of unavoidable impacts of the Project**

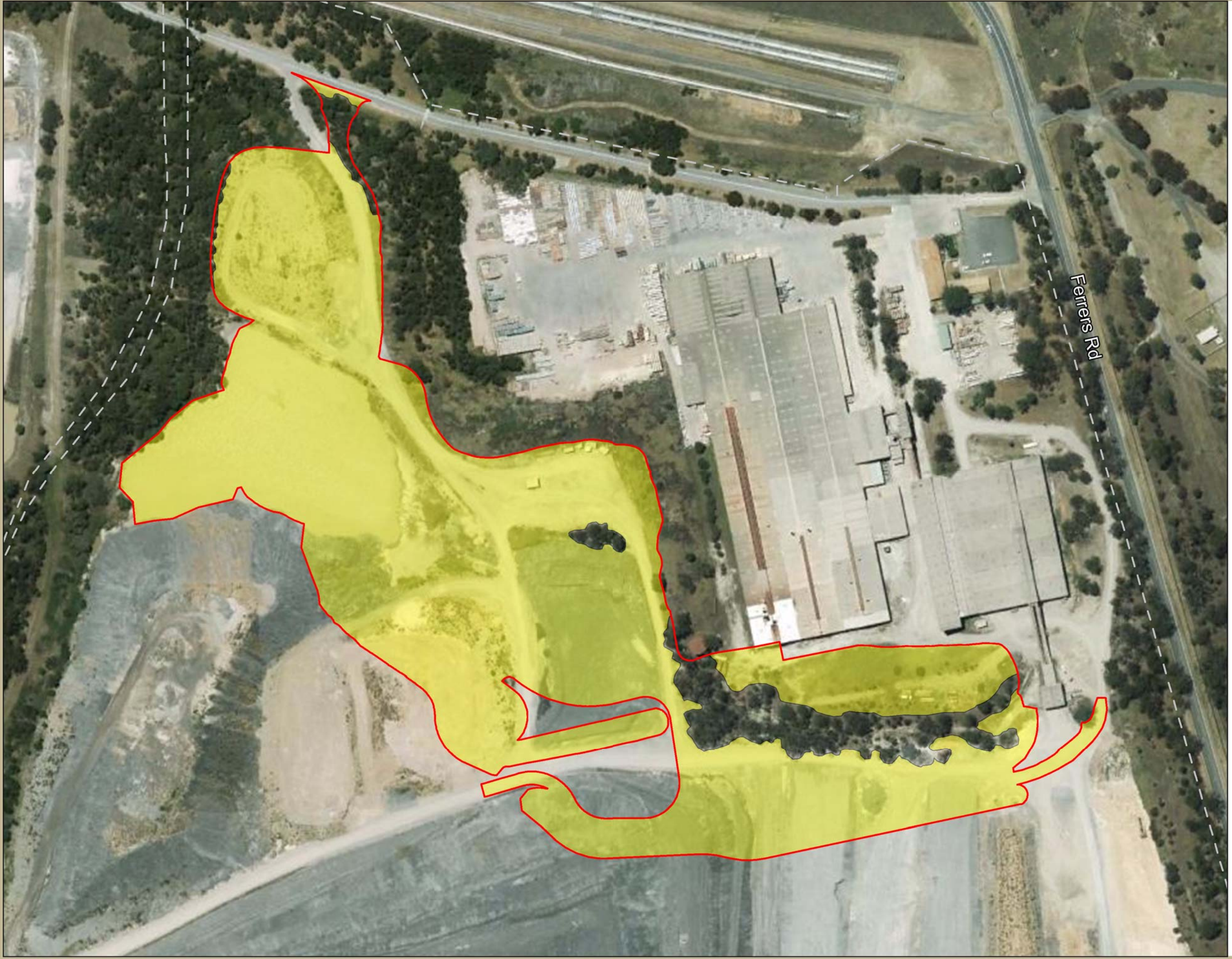
Threshold	Biodiversity Value	Criteria	Applicable to the Project?
I. Impacts that require further consideration by consent authority	Landscape Features	Impacts that will substantially reduce the width of vegetation in the riparian buffer zone bordering rivers and streams 4th order or greater	No
		Impacts 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: • cause the extinction of the CEEC from the IBRA subregion, or • significantly reduce the viability of the CEEC	No
		Any impact on an EEC nominated in the SEARs because it is likely to: • cause the extinction of the EEC from the IBRA subregion, or • significantly reduce the viability of the EEC	No
	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: • cause the extinction of a species or population from an IBRA subregion, or • significantly reduce the viability of a species or population	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

Table 7.2 **Thresholds for the assessment and offsetting of unavoidable impacts of the Project**

Threshold	Biodiversity Value	Criteria	Applicable to the Project?
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	Yes – The Project will remove 0.41 ha of HN528 CEEC and 0.33 ha of HN526 EEC (Figure 7.2).
		Impacts on PCTs associated with threatened species habitat and which have a site value score ≥ 17	No
	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 ≥ 17	No
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: • have a site value score < 17, or • are not identified as CEECs / EECs	No
		Impacts on PCTs that are not associated with threatened species habitat and are not	No

Table 7.2 **Thresholds for the assessment and offsetting of unavoidable impacts of the Project**

Threshold	Biodiversity Value	Criteria	Applicable to the Project?
		identified as CEECs / EECs	
	Species and populations	Impacts on non-threatened species and populations that do not form part of a CEEC or EEC	Yes – The Project will impact on non-threatened species and populations 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
V. 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	Yes – the Project will impact on 7.94 ha of currently cleared land and exotic/native regrowth (Figure 7.1).
	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



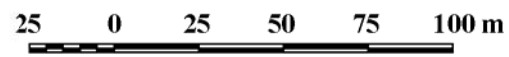
- Legend**
- Development Site
 - Lot Boundary
 - Areas not requiring assessment

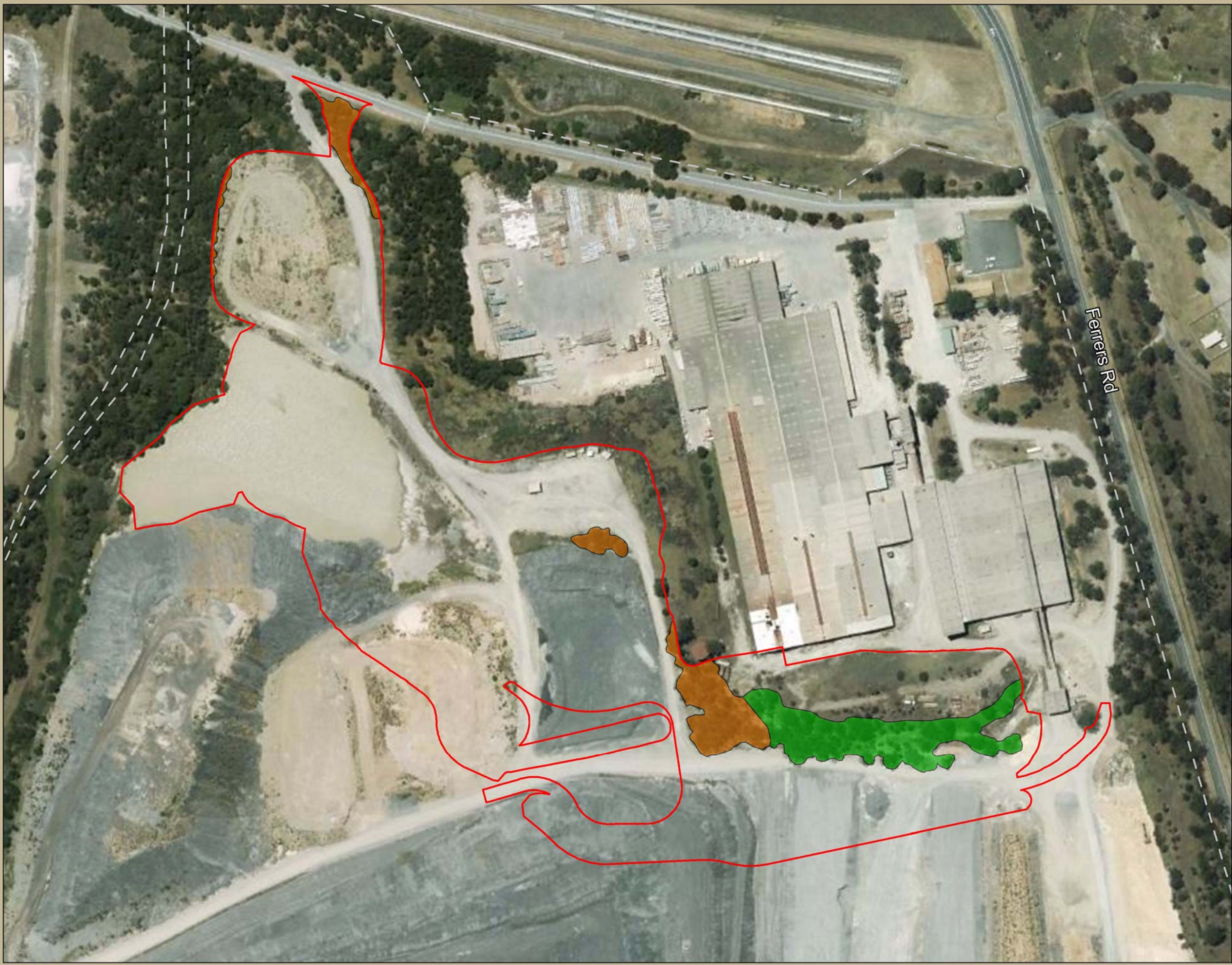
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Figure 7.1. Areas not requiring assessment





Legend

Development Site

Lot Boundary

PCT

Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)

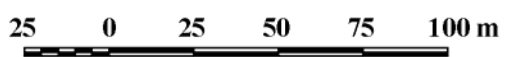
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528)

Image Source:
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Figure 7.2. PCTs requiring offset



Conclusion

i. Purpose of the BAR

This BAR has been prepared to inform a State Significant Development (SSD) Application for the development at Plant Number 2 of the existing Brickworks facility at 780 Wallgrove Road. 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.

ii. Land use history and context of the Austral Bricks land

The Austral Bricks land has a long history of industrial/quarrying usage dating back to the earliest consents in the 1960s. Consequently it already contains infrastructure such as quarry roads, various earthworks and buildings.

Previous use of the Austral Bricks land has cleared much of the original vegetation, with the result that most remaining patches in the central and southern portions of the Austral Bricks land are small, degraded and relatively isolated.

iii. Summary of Scale and Extent of Impacts

The Project would be located in areas largely cleared for quarry roads and earthworks. The proposed Development Site is also linked to and in close proximity to the roads and buildings in the north eastern side of the site for functional purposes.

Several minor and degraded patches of woodland occur within the Development Site and would be cleared. Avoidance of such patches had not been considered feasible and retention of such vegetation would be of limited ecological value because of ongoing threats (particularly edge effects from erosion, weed invasion, etc) and because there is a low chance of restoring and regenerating habitat connectivity in the future due to the zoning of the Austral Bricks land.

The proposed Development Site boundary would not result in clearing or other losses of corridor vegetation on the Austral Bricks land. The most intact areas of TEC vegetation would therefore be retained. Vegetation along the corridor associated with Eastern Creek, strips of vegetation along Wallgrove Road, and strips of vegetation along the northern and south eastern boundaries of the Austral Bricks land have been avoided by the proposal.

The **direct ecological impacts** of the Project will be to remove small patches of relatively isolated and degraded vegetation. This 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:

- 10 ecosystem credits for HN526 (Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin); and
- 13 ecosystem credits for HN528 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin).

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 vegetation along the eastern side of Eastern Creek, a patch of vegetation in the north (adjacent to the proposed road exit) and an area of vegetation along the eastern boundary of the Austral Bricks land at the Ferrers Road frontage. 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).

The Project will include a suite of measures designed to minimise the impacts on retained vegetation.

iv. *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 the Austral Bricks land:

- Acquiring and retiring of 23 BioBanking ecosystem credits in order to offset residual direct impacts, i.e. clearing of native vegetation and loss of fauna habitat. The credits can be of the following composition

- 10 HN526 credits and 13 HN528 credits; or
 - 7 HN526 credits and 16 HN528 credits.
- Cumberland Plain Woodland, assigned to PCT HN528. Approximately 0.41 ha of degraded vegetation will be required to be cleared within the Development Site and does not form significant habitat for threatened species;
 - River-flat Eucalypt Forest on Coastal Floodplains, assigned to PCT HN526. Approximately 0.33 ha of degraded vegetation will be required to be cleared within the Development Site and does not form significant habitat for threatened species;
 - 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;
 - Grey-headed Flying-fox (*Pteropus poliocephalus*). The Grey-headed Flying-fox is assessed and accounted for via the ecosystem credit process; and
 - No threatened flora species.

v. *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 subject site and there are no matters requiring further consideration under this Act.

The proposal is impacting on waterfront lands based on a 40 m setback from top of bank. A referral to the NSW Office of Water is required in accordance with the requirements of the *Water Management Act 2000* and its regulation.

vi. *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 Austral Bricks land:

- Grey-headed Flying-fox (*Pteropus poliocephalus*). The Grey-headed Flying-fox is assessed and accounted for via the ecosystem credit process;
- No protected migratory bird species;
- No threatened flora species;
- No TECs; and
- GDE terrestrial vegetation, represented by PCT HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin.

The Grey-headed Flying-fox and the loss of such vegetation are proposed to be offset by the acquisition and retirement of ecosystem credits via BioBanking.

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.

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Appendix A

Plot and Transect Data

Table A.1 Plot and Transect Data from the Development Site and Adjacent Land

Plot Name	Q1	Q2	Q3	Q5	Q6
PCT	HN528	-	-	HN526	HN528
Date	20/10/2015	20/10/2015	20/10/2015	20/10/2015	20/10/2015
Easting	302873	302852	302550	302801	302540
Northing	6254959	6254976	6255177	6254969	6255325
Native Plant Species Richness	10	8	3	11	9
Over-storey Cover	7.5	0	0	20.5	7.5
Mid-storey Cover	7	10.5	0	9	14.5
Native Ground Cover (Grasses)	0	0	0	0	20
Native Ground Cover (Shrubs)	4	0	0	0	2
Native Ground Cover (Other)	6	10	92	6	18
Exotic Plant Cover	30.6	26.67	1.3	23.33	26.17
Number of Trees with Hollows	0	0	0	0	1
Over-storey Regeneration	1	0	0	1	0
Total Length of Fallen Logs	0	0	0	0	0

Appendix B

Flora Species List

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Trees					
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black She-oak			
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak			
Casuarinaceae	<i>Casuarina cunninghamiana</i>	River Oak			
Cupressaceae	<i>Cupressus sempervirens</i>	Italian Cypress	*		
Euphorbiaceae	<i>Triadica sebifera</i>	Chinese Tallow Tree	*		
Mimosaceae	<i>Acacia baileyana</i>	Cootamundra Wattle			
Mimosaceae	<i>Acacia decurrens</i>	Black Wattle			
Mimosaceae	<i>Acacia parramattensis</i>	Parramatta Wattle			
Moraceae	<i>Morus alba</i>	Mulberry	*		
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple			
Myrtaceae	<i>Corymbia maculata</i>	Spotted Gum			
Myrtaceae	<i>Eucalyptus amplifolia</i>	Cabbage Gum			
Myrtaceae	<i>Eucalyptus elata</i>	River Peppermint			
Myrtaceae	<i>Eucalyptus fibrosa</i>	Broad Leaved Ironbark			
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box			
Myrtaceae	<i>Eucalyptus punctata</i>	Grey Gum			
Myrtaceae	<i>Eucalyptus robusta</i>	Swamp Mahogany			

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Myrtaceae	<i>Eucalyptus saligna</i>	Sydney Blue Gum			
Myrtaceae	<i>Eucalyptus scoparia</i>	Wallangarra White Gum		E	V
Myrtaceae	<i>Eucalyptus sideroxylon</i>	Red Ironbark			
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum			
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree			
Proteaceae	<i>Grevillea robusta</i>	Silky Oak			
Santalaceae	<i>Exocarpos cupressiformis</i>	Native Cherry			
Shrubs					
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow Leaf Cotton Bush	*		
Apocynaceae	<i>Nerium oleander</i>	Oleander Bush	*		
	<i>Chrysanthemoides monilifera subsp. rotundata</i>	Boneseed	*		
Asteraceae	<i>Ozothamnus diosmifolius</i>	White Dogwood			
Asteraceae	<i>Senecio pterophorus</i>	African Daisy	*		
Euphorbiaceae	<i>Ricinus communis</i>	Castor Oil Plant	*		
Fabaceae	<i>Dillwynia sieberi</i>	Prickly Parrot-pea			
Mimosaceae	<i>Acacia falcata</i>	Sickle Wattle			
Mimosaceae	<i>Acacia fimbriata</i>	Fringed Wattle			
Mimosaceae	<i>Acacia implexa</i>	Hickory			

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Mimosaceae	<i>Acacia longifolia</i> var. <i>longifolia</i>	Sydney Golden Wattle			
Mimosaceae	<i>Acacia</i> sp.	-			
Myrtaceae	<i>Callistemon</i> sp. (cultivar)	-			
Myrtaceae	<i>Callistemon viminalis</i>	Weeping Bottlebrush			
Myrtaceae	<i>Melaleuca armillaris</i>	Bracelet Honey Myrtle			
Myrtaceae	<i>Melaleuca decora</i>	-			
Myrtaceae	<i>Callistemon citrinus</i>	Crimson Bottlebrush			
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet	*		
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	*		
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed	*		
Pittosporaceae	<i>Bursaria spinosa</i> var. <i>spinosa</i>	Native Blackthorn			
Proteaceae	<i>Grevillea</i> sp. (cultivar)	-			
Rosaceae	<i>Rubus fruticosus</i> sp. agg.	Blackberry Complex	*		
Rubiaceae	<i>Opercularia diphylla</i>	-			
Sapindaceae	<i>Dodonaea viscosa</i>	Broad-leaf Hop Bush			
Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco	*		
Solanaceae	<i>Solanum sisymbriifolium</i>	-			
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	*		

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Verbenaceae	<i>Lantana camara</i>	Lantana	*		
Verbenaceae	<i>Lantana montevidensis</i>	Creeping Lantana	*		
Groundcovers					
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet			
Acanthaceae	<i>Pseuderanthemum variabile</i>	Pastel Flower			
Asphodelaceae	<i>Aloe vera</i>	Aloe Vera	*		
Amaranthaceae	<i>Amaranthus viridis</i>	Green Amaranth	*		
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery	*		
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort			
Apiaceae	<i>Foeniculum vulgare</i>	Fennel	*		
Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed	*		
Asteraceae	<i>Aster subulatus</i>	Wild Aster	*		
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	*		
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	*		
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	*		
Asteraceae	<i>Conyza canadensis</i>	Tall Fleabane	*		
Asteraceae	<i>Conyza sumatrensis</i>	Fleabane	*		
Asteraceae	<i>Hypochaeris radicata</i>	Flatweed	*		

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Asteraceae	<i>Lactuca serriola</i>	Prickly Lettuce	*		
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	*		
Asteraceae	<i>Sigesbeckia orientalis</i>	Indian Weed			
Asteraceae	<i>Sonchus oleraceus</i>	Common Sow-thistle	*		
Asteraceae	<i>Tagetes minuta</i>	Stinking Roger	*		
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	*		
Asteraceae	<i>Vernonia cinerea</i> var. <i>cinerea</i>	-			
Asteraceae	<i>Vittadinia cuneata</i> var. <i>cuneata</i>	Fuzzweed			
Boraginaceae	<i>Heliotropium amplexicaule</i>	Blue Heliotrope	*		
Brassicaceae	<i>Rapistrum rugosum</i>	Turnip Weed	*		
Brassicaceae	<i>Brassica fruticulosa</i>	Twiggy Turnip	*		
Brassicaceae	<i>Brassica rapa</i>	Wild Turnip	*		
Brassicaceae	<i>Lepidium africanum</i>	Common Peppergrass	*		
Cactaceae	<i>Opuntia stricta</i>	Prickly Pear	*		
Caryophyllaceae	<i>Stellaria media</i>	Common Chickweed	*		
Chenopodiaceae	<i>Atriplex semibaccata</i>	Creeping Saltbush			
Chenopodiaceae	<i>Atriplex patula</i>	Common Orache	*		
Chenopodiaceae	<i>Chenopodium album</i>	Fat Hen	*		

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	EPBC		
			Exotic	Act	TSC Act
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush			
Chenopodiaceae	<i>Einadia nutans subsp. nutans</i>	Climbing Saltbush			
Clusiaceae	<i>Hypericum gramineum</i>	Small St Johns Wort			
Clusiaceae	<i>Hypericum perforatum</i>	St Johns Wort	*		
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed			
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	*		
Euphorbiaceae	<i>Acalypha australis</i>	-	*		
Euphorbiaceae	<i>Chamaesyce drummondii</i>	Caustic Weed			
Fabaceae	<i>Lotus suaveolens</i>	Hairy Bird's Foot Trefoil	*		
Fabaceae	<i>Trifolium repens</i>	White Clover	*		
Fabaceae (Faboideae)	<i>Melilotus indicus</i>	Hexham Scent	*		
Gentianaceae	<i>Centaurium tenuiflorum</i>	-	*		
Juncaceae	<i>Juncus acutus</i>	-	*		
Liliaceae	<i>Agapanthus praecox</i>	Agapanthus	*		
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot			
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	*		
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	*		
Myrsinaceae	<i>Anagallis arvensis</i>	Blue Pimpernel	*		

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Oxalidaceae	<i>Oxalis corniculata</i>	Yellow Wood Sorrel	*		
Oxalidaceae	<i>Oxalis perennans</i>	-			
Phormiaceae	<i>Dianella longifolia</i>	-			
Plantaginaceae	<i>Plantago lanceolata</i>	Ribwort	*		
Plantaginaceae	<i>Veronica plebeia</i>	Creeping Speedwell			
Poaceae	<i>Avena barbata</i>	Beaded Oats	*		
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass			
Poaceae	<i>Sporobolus creber</i>	Western Rat-tail Grass			
Poaceae	<i>Bothriochloa macra</i>	Red Grass			
Poaceae	<i>Aristida vagans</i>	Three-awn Speargrass			
Poaceae	<i>Austrodanthonia longifolia</i>	Long-leaved Wallaby Grass			
Poaceae	<i>Austrodanthonia racemosa</i>	Wallaby Grass			
Poaceae	<i>Avena fatua</i>	Wild Oats	*		
Poaceae	<i>Bromus catharticus</i>	Prairie Grass	*		
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	*		
Poaceae	<i>Chloris truncata</i>	Windmill Grass			
Poaceae	<i>Chloris ventricosa</i>	Tall Chloris			
Poaceae	<i>Cortaderia selloana</i>	Pampas Grass	*		

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Poaceae	<i>Cynodon dactylon</i>	Common Couch			
Poaceae	<i>Echinochloa crus-galli</i>	Barnyard Grass	*		
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	*		
Poaceae	<i>Eleusine tristachya</i>	Goose Grass	*		
Poaceae	<i>Entolasia stricta</i>	Wiry Panic			
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	*		
Poaceae	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass			
Poaceae	<i>Melinis repens</i>	Red Natal Grass	*		
Poaceae	<i>Oplismenus imbecillis</i>	-			
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	*		
Poaceae	<i>Pennisetum clandestinum</i>	Kikuyu	*		
Poaceae	<i>Setaria parviflora</i>	-	*		
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass	*		
Poaceae	<i>Themeda australis</i>	Kangaroo Grass			
Poaceae	<i>Urochloa panicoides</i>	Urochloa Grass	*		
Solanaceae	<i>Solanum nigrum</i>	Black Nightshade	*		
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade			
Solanaceae	<i>Solanum pseudocapsicum</i>	-	*		

Table B.1 Flora Species List from Development Site and Adjacent Land

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Typhaceae	<i>Typha orientalis</i>	Cumbungi			
Verbenaceae	<i>Verbena officinalis</i>	Common Verbena	*		
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	*		
Verbenaceae	<i>Verbena litoralis</i>	Coastal Verbena	*		
Epiphytes					
Loranthaceae	<i>Amyema pendulum</i>	Mistletoe			
Vines					
Apocynaceae	<i>Araujia sericifera</i>	Moth vine	*		
Asparagaceae	<i>Asparagus asparagoides</i>	Bridal Creeper	*		
Basellaceae	<i>Anredera cordifolia</i>	Madeira Vine	*		
Convolvulaceae	<i>Ipomoea indica</i>	Blue Morning Glory	*		
Convolvulaceae	<i>Polymeria calycina</i>	Bindweed			
Fabaceae	<i>Glycine clandestina</i>	Twining Glycine			
Fabaceae	<i>Glycine tabacina</i>	Variable Glycine			
Fabaceae	<i>Hardenbergia violacea</i>	False Sarsparilla			
Fabaceae	<i>Kennedia rubicunda</i>	Dusky Coral Pea			
Fabaceae	<i>Vicia sativa subsp. sativa</i>	Common Vetch	*		
Ranunculaceae	<i>Clematis glycinoides</i>	Headache Vine			

Table B.1 **Flora Species List from Development Site and Adjacent Land**

Family	Scientific Name	Common Name	Exotic	EPBC	
				Act	TSC Act
Ranunculaceae	<i>Clematis glycinoides</i>	Headache Vine			
Sapindaceae	<i>Cardiospermum grandiflorum</i>	Balloon Vine, Love in a Puff	*		

Appendix C

Fauna Species List

Table C.1 Fauna Species list from the Development Site and Adjacent Land

Family	Scientific name	Common name	Exotic	EPBC Act	TSC Act
Birds					
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie			
Corvidae	<i>Corvus coronoides</i>	Australian Raven			
Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck			
Meliphagidae	<i>Manorina melanophrys</i>	Bell Miner			
Charadriidae	<i>Elseyornis melanops</i>	Black-fronted Dotterel			
Acrocephalidae	<i>Acrocephalus stentoreus</i>	Clamorous Reed-Warbler			
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird			
Rhipiduridae	<i>Rhipidura fuliginosa</i>	Grey Fantail			
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark			
Charadriidae	<i>Vanellus miles</i>	Masked Lapwing			
Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner			
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet			
Estrildidae	<i>Neochmia temporalis</i>	Red-browed Finch			
Meliphagidae	<i>Anthochaera carunculata</i>	Red Wattlebird			
Pycnonotidae	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	*		
Timaliidae	<i>Zosterops lateralis</i>	Silvereye			
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote			
Maluridae	<i>Malurus cyaneus</i>	Superb Fairy-wren			

Table C.1 Fauna Species list from the Development Site and Adjacent Land

Family	Scientific name	Common name	Exotic	EPBC Act	TSC Act
Maluridae	<i>Malurus lamberti</i>	Variegated Fairy-wren			
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow			
Acanthizidae	<i>Sericornis frontalis</i>	White-browed Scrubwren			
Meliphagidae	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater			
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail			
Meliphagidae	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater			
Mammals					
Muridae	<i>Rattus rattus</i>	Black Rat	*		
Leporidae	<i>Lepus lepus</i>	Brown Hare	*		
Felidae	<i>Felis catus</i>	Cat (feral)	*		
Pseudocheiridae	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum			
Molossidae	<i>Mormopterus ridei</i>	Eastern Freetail-bat			
Canidae	<i>Vulpes vulpes</i>	European Red Fox	*		
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox		V	V
Vespertilionidae	<i>Nyctophilus sp</i>	Long-eared Bat			
Reptiles					
Scincidae	<i>Lampropholis delicata</i>	Delicate Skink			
Chelidae	<i>Chelodina longicollis</i>	Eastern Long-necked Turtle			

Table C.1 Fauna Species list from the Development Site and Adjacent Land

Family	Scientific name	Common name	Exotic	EPBC Act	TSC Act
Scincidae	<i>Lampropholis guichenoti</i>	Grass Skink			
Elapidae	<i>Pseudechis porphyriacus</i>	Red-Bellied Black Snake			
Amphibians					
Myobatrachidae	<i>Crinia signifera</i>	Common Eastern Froglet			
Mollusc					
Camaenidae	<i>Meridolum corneovirens</i>	Cumberland Land Snail			E

Appendix D

BioBanking Report

Biodiversity credit report



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

Date of report: 26/10/2015

Time: 4:13:59PM

Calculator version: v4.0

Major Project details

Proposal ID:	0057/2015/2266MP
Proposal name:	15164 - 780 Wallgrove Road, Horsley Park
Proposal address:	1 Mountain St Epping NSW 2121
Proponent name:	Cumberland Ecology
Proponent address:	1 Mountain St Epping NSW 2121
Proponent phone:	0298681933
Assessor name:	David Robertson
Assessor address:	PO BOX 2474 Carlingford Court NSW 2118
Assessor phone:	02 9868 1933
Assessor accreditation:	0057

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	0.33	10.00
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.41	13.39
Total	0.74	23

Credit profiles

1. Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, (HN526)

Number of ecosystem credits created	3
IBRA sub-region	Cumberland - Hawkesbury/Nepean

Offset options - Plant Community types	Offset options - IBRA sub-regions
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, (HN526) Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (HN528)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, (HN528)

Number of ecosystem credits created13

IBRA sub-regionCumberland - Hawkesbury/Nepean

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, (HN528)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, (HN526)

Number of ecosystem credits created	7
IBRA sub-region	Cumberland - Hawkesbury/Nepean

Offset options - Plant Community types	Offset options - IBRA sub-regions
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion, (HN526)	Cumberland - Hawkesbury/Nepean and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required