

**OAKDALE WEST ESTATE STATE SIGNIFICANT
DEVELOPMENT**

Biodiversity Offset Strategy

For:

Goodman Property Services (Aust) Pty Ltd

March 2017

Final Report



**PO Box 2474
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Report No. 15122RP2

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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009		GK	Offset site mapping amendments

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Table of Contents

EXECUTIVE SUMMARY

1 INTRODUCTION

1.1	Purpose	1.1
1.2	Objectives of the Biodiversity Offset Strategy	1.2
1.3	Overview of the Project	1.2

2 SUMMARY OF IMPACTS OF THE PROJECT

2.1	Impacts of the Project	2.1
2.1.1	Impacts to Plant Communities	2.1
2.1.2	Impacts to Threatened Species	2.2
2.1.3	Impacts that Require Further Consideration	2.5
2.2	Impacts of the Project that Require Offsetting	2.6
2.2.1	Native Vegetation	2.6

3 POLICY FRAMEWORK OF THE OFFSET STRATEGY

3.1	Principles of Biodiversity Offsets for Major Projects	3.0
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4 OFFSET SITE IDENTIFICATION

4.1	Proposed Offset Measures	4.3
4.2	Oakdale West Offset Site Details	4.3
4.2.1	Location	4.3
4.2.2	General Description of Offset Site	4.3
4.2.3	Management Actions Proposed for the Offset Site to Improve Biodiversity Values	4.6
4.3	Improvement in Biodiversity Values at the Onsite Offset Site	4.8
4.3.1	Ecosystem Credits Created at the Offset site	4.8
4.3.2	Species Credits Created at the Offset site	4.10
4.3.3	Justification for any Variation to the Offset Rules	4.10
4.3.4	Averted Loss at the Oakdale West Offset Site	4.11
4.4	Securing the Oakdale West Offset Site	4.11

Table of Contents *(Cont'd)*

4.5	Credit Balance	4.11
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5 CONCLUSION

REFERENCES

List of Appendices

A. BIOBANKING CREDIT CALCULATOR REPORT

List of Tables

2.1	Summary of areas directly impacted by the Project	2.1
2.2	Predicted ecosystem credit species	2.3
2.3	Credit Requirement for the Project	2.7
4.1	PCTs at the Proposed Offset Site	4.5
4.2	Summary of Additional Management Actions at the Oakdale West Offset Site	4.7
4.3	Summary of PCTs and Ecosystem Credits generated at the Oakdale West Offset Site	4.9
4.4	Credit Balance for Ecosystem Credits at the Oakdale West Offset Site	4.12
4.5	Credit Balance for Ecosystem Credits at the Oakdale South Offset Site	4.13
4.6	Total Combined Credit Balance Remaining	4.13

List of Figures

4.1	Location of the Oakdale West Offset Site	4.14
4.2	PCTs at the Oakdale West Offset Site	4.15
4.3	Management Zones at the Oakdale West Offset Site	4.16

Glossary of Terms

BAR	Biodiversity Assessment Report
BBAM	BioBanking Assessment Methodology
BBCC	BioBanking Credit Calculator v2.0
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
DP&E	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
FBA	NSW Framework For Biodiversity Assessment
IBRA	Interim Biogeographic Regionalisation for Australia
IBRA region	A bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
IBRA sub-region	a subregion of a bioregion identified under the IBRA system and based on major catchment areas
LGA	Local Government Area
NSW	New South Wales
OEH	NSW Office of Environment and Heritage of the Department of Premier and Cabinet
PCT	Plant Community Type
the Project	The staged development of a warehouse and distribution complex within the Oakdale West precinct of the broader Oakdale Estate which is located within the Western Sydney Employment Area
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TEC	Threatened Ecological Community
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
WSEA SEPP	NSW <i>State Environmental Planning Policy (Western Sydney Employment Area) 2009</i>

Executive Summary

S1 Introduction

Cumberland Ecology was commissioned by Goodman Property Services (Aust) Pty Ltd (Goodman) to prepare a Biodiversity Offset Strategy (BOS) for Oakdale West Estate State Significant Development (the 'Project') Masterplan. The Project involves the staged development of a warehouse and distribution complex.

This BOS, in conjunction with the Biodiversity Assessment Report (BAR) (Cumberland Ecology, 2017) will form part of the Environmental Impact Statement (EIS) being prepared for Goodman to support an application for State Significant Development Consent under Division 4.1 of Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this BOS is to establish a commitment to offsetting the impacts of the Project on threatened species, populations and communities. The BOS has been prepared to address the NSW Department of Planning and Environment (DP&E) issued Secretary's Environmental Assessment Requirements (SEARs) for the Project, which state that the impacts of the Project must be assessed in accordance with the *NSW Office of Environment and Heritage Framework for Biodiversity Assessment under the NSW Biodiversity Offsets Policy for Major Projects*.

The Project seeks to facilitate the development of the Oakdale West precinct into a regional warehousing and distribution hub. The Project also involves the construction of a North/South Link Road between the proposed Oakdale West Warehouse hub and the Erskine Park East-West Link Road.

The main warehouse hub of the Oakdale West development is located on land owned by Goodman while the North/South Link Road runs through lands to the north of the Goodman land. The majority of the North/South Link Road passes through land owned by Fitzpatrick Investments Pty Ltd (Fitzpatrick). As the Fitzpatrick land has previously been assessed for ecological impacts and has received approval for development subject to the creation of a conservation zone, the area of the SSD Application that lies within the Fitzpatrick lands is not considered as part of the development site in the BAR

S2 Summary of Impacts of the Project

The development site is largely located within grassland used for cattle grazing so as to minimise environmental impacts to vegetation. 95% of the vegetation within the development area comprises low diversity/exotic grassland or planted native vegetation that does not meet the determination of a native Plant Community Type (PCT) with the remaining 5% comprising Critically Endangered and Endangered Ecological Communities (C/EECs). These

C/EECs consist of remnant patches of fragmented, degraded and isolated vegetation. As such; it is unlikely that such small areas of C/EECs are viable in the future if left in their current state.

The proposal will unavoidably remove 5.45 ha of native vegetation and 111.04 ha of immature planted vegetation and exotic grassland. The native vegetation conforms to four PCTs that are threatened ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act) and *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- HN526 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (TSC Act EEC);
- HN528 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (TSC Act CEEC and EPBC Act CEEC);
- HN529 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (TSC Act CEEC and EPBC Act CEEC); and
- HN594 Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (TSC Act EEC).

A total of 24 *Grevillea juniperina* subsp. *juniperina* (Juniper-leaved Grevillea) individuals, listed as vulnerable under the TSC Act, were located within the Link Road footprint on Fitzpatrick land. The offsetting for the removal of these individuals forms part of the approvals for the development of the Fitzpatrick land and is therefore not addressed further in this BOS.

The BioBanking credit calculator (OEH, 2014b) generates a list of predicted ecosystem credit species utilising a number of site variables which includes IBRA subregion, associated PCTs, percent native vegetation in outer assessment circle, condition of vegetation, patch size and credit type. Based on these variables at the development site, the following threatened ecosystem species were predicted:

- Barking Owl (*Ninox connivens*);
- Masked Owl (*Tyto novaehollandiae*); and
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).

S3 Policy Framework of the Offset Strategy

The *NSW Biodiversity Offsets Policy for Major Projects* was adopted in September 2014 and applies to State Significant Developments 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 (NSW Government, 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 (NSW Government, 2014a).

S4 Offset Site Identification

This BOS proposes to establish an offset site adjacent to the development site to be secured under a BioBanking Agreement (the Oakdale West Offset Site) in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*. In addition, an Onsite Offset Site is to be established to offset the impact of the Oakdale South Estate SSDA (Cumberland Ecology, 2016a) and will be utilised, where available, for any surplus ecosystem credits required for the balance of Oakdale West Estate impacts. As the Onsite Offset Site has been described within the Oakdale South Estate Biodiversity Offset Strategy (Cumberland Ecology, 2016b), it is not further described in this BOS.

The majority of the Oakdale West Offset Site is located adjacent to the development site between the power easement and Ropes Creek to the east, with additional sections located to the west of the development site. The Oakdale West Offset Site is situated so as to make use of land that holds the highest biodiversity values within lands adjacent to the development site. The eastern part of the Oakdale West Offset Site is comprised of two areas with the main area to the east of the power easement running north to south along the Ropes Creek riparian corridor. There is a smaller portion of the Oakdale West Offset Site, which consists of a remnant patch of woodland to the south of the convergence of two power easements. The western part of the Oakdale West Offset Site consists of two remnant patches of woodland along the north-western boundary of the development site.

Landform at the Oakdale West Offset Site is relatively uniform, primarily consisting of an ephemeral creek line along Ropes Creek, with adjacent areas of undulating rises and alluvial flats with the topography rising along the western portion of the site. The topography does not have any large variances like mountains or cliff lines.

Native vegetation has been surveyed at the offset site in accordance with the FBA, and it has been determined that the native vegetation comprises approximately 44% of the vegetated cover of the Oakdale West Offset Site in the form of four PCTs.

The existing PCTs that have been identified at the Oakdale West Offset Site are:

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

- HN528 (moderate – good): Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin;
- HN529 (moderate – good): Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion; and
- HN594 (moderate – good): Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion.

The remainder of the Oakdale West Offset Site is currently cleared for agriculture and is dominated by exotic pasture grasses. Within areas of native vegetation in the offset site, the ground layer is frequently dominated by exotic species, and the shrub layer is almost absent.

The offset site will be managed for biodiversity outcomes under a BioBanking Agreement, which will provide security of funding and mandatory, auditable management requirements for the offset site in perpetuity. The offset site will be managed under the stipulation of a Biodiversity Plan of Management to be submitted within a Biodiversity Assessment Report (BAR) for the Oakdale West Offset Site. Management actions at the offset site will include standard management actions as prescribed by the BBAM (OEH, 2014a). Additional management actions proposed at the offset site to improve biodiversity values include fox control, and management of exotic and overabundant herbivores and slashing. Details of the management actions will be specified within the BAR for the offset site.

S5 Conclusion

This Biodiversity Offset Strategy has been drafted to propose and establish a commitment to offset the unavoidable impacts to native vegetation and threatened species resulting from the development of Oakdale West Estate. This BOS has been prepared with the specific aim of satisfying the requirements to offset as specified within *Section 10* of the FBA (NSW Government, 2014a).

The Oakdale West Offset Site will be secured in perpetuity by preparing a BioBanking Assessment Methodology (BBAM) BAR and BioBanking Agreement Application for the site following approval of the Oakdale West Estate development.

The deficit of credits for the PCT HN594 Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion will be fully supplemented by the surplus credits created at the Oakdale South Offset Site (Cumberland Ecology, 2016b)

The majority of the deficit of credits for the PCT HN526 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin will be supplemented by the surplus credits created at the Oakdale South Offset Site (Cumberland Ecology, 2016b). The remaining deficit will be offset through the purchase of credits on the open market and then retired, as required

The deficit of ecosystem credits for HN529 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion will be partially offset through the substitution with the surplus of HN528 credits generated onsite. The remainder

of the deficit will be offset through the purchase of credits on the open market and then retired, as required.

The offset for the impacts to *Grevillea juniperina* subsp. *juniperina* on Fitzpatrick land form part of the approvals for the development of the Erskine Park Employment Area and therefore are not addressed in this BOS.

As the Oakdale West Estate development is a staged development, BioBanking credits will be retired as required by that stage of earthworks; however, revegetation and management of the biobank site will commence from approval of the BioBanking Agreement.

Introduction

Cumberland Ecology was commissioned by Goodman Property Services Ltd (Goodman) to prepare a Biodiversity Offset Strategy (BOS) for the Oakdale West State Significant Development (the 'Project') Masterplan. The Project involves the staged development of a warehouse and distribution complex. This BOS, in conjunction with the Biodiversity Assessment Report (BAR) (Cumberland Ecology, 2017) will form part of the Environmental Impact Statement (EIS) being prepared for Goodman to support an application for State Significant Development Consent under Division 4.1 of Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Purpose

The purpose of this BOS is to establish a commitment to offsetting the impacts of the Project on threatened species, populations and communities. The BOS has been prepared to address the NSW Department of Planning and Environment (DP&E) issued Secretary's Environmental Assessment Requirements (SEARs) for the Project, which state that the impacts of the Project must be assessed in accordance with the NSW Office of Environment and Heritage (OEH) *Framework for Biodiversity Assessment 2014* (FBA) under the *NSW Biodiversity Offsets Policy for Major Projects 2014*. Specifically, the objectives of this document are to:

- Propose an offset strategy to fully compensate for unavoidable impacts of the Project;
- Propose an offset site for the Project;
- Summarise native vegetation extent within the proposed offset site;
- Propose management actions to improve biodiversity values at the proposed offset site;
- Identify ecosystem credits generated at the proposed offset site; and
- Propose offset strategy for ecosystem credits that cannot be generated at the proposed offset site.

1.2 Objectives of the Biodiversity Offset Strategy

The objective of the BOS is to provide guidance for the delivery of mitigation measures for the impacts expected as a result of the Project and to achieve a long-term conservation gain for the threatened species, populations and communities impacted by the Project. The following have been considered in establishing the objectives for the BOS:

- Securing the protection and management areas containing impacted threatened species and vegetation communities in perpetuity;
- Providing an area of offset that is greater than the impacts of the Project; and
- Providing habitat and vegetation communities that is of equal to or better condition than that impacted by the Project.

1.3 Overview of the Project

The Project is located within the Oakdale West precinct of the broader Oakdale Estate which is located within the Western Sydney Employment Area designated under the NSW *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (WSEA SEPP). The project is located within Penrith Local Government Area (LGA) and the nearest town centres are Erskine Park and Horsley Park, which are both approximately 6 km west and east respectively from the Project. The Project is accessed currently via Bakers Lane and is proposed to be accessed via the proposed North-South Link Road that is a part of this development application. There are several other developments adjoining the Project within a broader industrial precinct.

The Project comprises the staged construction of a warehousing hub as well as a North/South Link Road between the proposed Oakdale West Warehouse hub and the Erskine Park East-West Link Road as identified in the WSEA SEPP. The main warehouse hub of the Oakdale West development is located on Goodman land which is wholly located within Lot 11 DP1178389. The North/South Link Road passes through Lot 3 DP 85393, Lot 2 DP 84578, Lot 6 DP 229784 and Lot 3031 DP 1168407.

Lot 3031 DP 1168407 comprises land owned by Fitzpatrick Investments Pty Ltd (Fitzpatrick) which forms part of the Erskine Park Employment Area. As the Fitzpatrick land has previously been assessed for ecological impacts and has received approval for development subject to the creation of a conservation zone (KMA, 2016), the area of the SSD Application that lies within the Fitzpatrick lands is not considered as part of the development site in the BAR or in this BOS.

The development site is approximately 118.68 ha in size and comprises the main proposed warehouse hub and the southern portions of the North/South Link road. Areas of the North/South Link Road within Fitzpatrick land (hereafter referred to as the 'Additional North South Link Road area') covers an area of approximately 4.90 ha.

Cumberland Ecology conducted an initial ecological assessment of the Oakdale Concept Plan in December 2007 (Cumberland Ecology, 2007). Owing to the period of time that had elapsed since the original ecological assessment of the Oakdale Concept Plan (Cumberland Ecology, 2007), it was decided that a new ecological assessment was to be conducted that encapsulated the new design plans.

Cumberland Ecology conducted flora and fauna surveys of the development site and adjoining land were conducted on 12 October 2015, 15 – 20 October 2015 and 8 April 2016. The surveys conducted included areas of the Fitzpatrick lands as a precautionary measure. Subsequent to the conduction of surveys, confirmation was received that further surveys and assessments were not required for areas contained within Fitzpatrick land as this area as previously been assessed in detail for ecological impacts (KMA, 2016) and has received approval for development subject to the creation of a conservation zone.

The development site contains both native and exotic vegetation with much of the development site comprising Low Diversity/Exotic grassland. The native vegetation within the offset site and immediate surrounds conforms to four Plant Community Types (PCTs) that are also threatened ecological communities (TECs) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act):

- Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (TSC Act);
- Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (TSC Act and EPBC Act);
- Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (TSC Act and EPBC Act); and
- Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (TSC Act).

Summary of Impacts of the Project

2.1 Impacts of the Project

2.1.1 Impacts to Plant Communities

The development site is largely located within land historically used for cattle grazing so as to minimise environmental impacts to native vegetation. Large areas of native vegetation are left intact to the west of the site. 95% of the vegetation within the development area comprises low diversity/exotic grassland or plantings. While the remaining 5% does include TECs, they consist of remnant patches of fragmented, degraded and isolated vegetation. It is unlikely that such small areas of TECs are viable in the future if left in their current state.

The proposal will unavoidably remove 5.45 ha of native vegetation and 111.04 ha of planted revegetation and low diversity/exotic grassland. Native vegetation to be removed includes four vegetation communities; all listed under the TSC Act as either Endangered Ecological Communities (EEC) or Critically Endangered Ecological Communities (CEEC) and one listed as a CEEC under the EPBC Act. A summary of the areas directly impacted within the development site is shown in **Table 2.1**.

Table 2.1 Summary of areas directly impacted by the Project

Vegetation	TSC Act Status	EPBC Act Status	Area to be Removed (ha)
HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	EEC	-	1.27
HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (TSC and EPBC Acts)	CEEC	CEEC	0.80
HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (TSC Act only)	CEEC	-	0.29
HN529: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (TSC and EPBC Acts)	CEEC	CEEC	1.29
HN529: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (TSC Act only)	CEEC	-	0.12

Table 2.1 Summary of areas directly impacted by the Project

Vegetation	TSC Act Status	EPBC Act Status	Area to be Removed (ha)
HN594: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	EEC	-	1. 68
Revegetation Areas, Exotic grassland and other Cleared Land	-	-	113.12
Total			118.68

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

2.1.2 Impacts to Threatened Species

Although the condition and nature of the habitats within the development site have been greatly altered by existing and historical land uses, it is evident that they still retain some value for the resident and visiting native fauna that were recorded in the development site. The regrowth areas generally lack many habitat features required to support threatened fauna species but areas of more mature habitat are also present in the development site that do retain valuable habitat features.

The FBA credit calculator generates a list of predicted ecosystem credit species utilising a number of site variables, which includes IBRA subregion, associated PCTs, percentage native vegetation in outer assessment circle, condition of vegetation, patch size and credit type. For the purposes of the BAR, the PCTs were broken down into vegetation zones based on distance of some isolated patches from other patches of native vegetation (100m distance as per FBA requirements) to accurately depict the predicted ecosystem credit species within vegetation zone. A total of nine vegetation zones were created within the development site. Based on these variables at the development site the following ecosystem credits are predicted to occur:

- Barking Owl (*Ninox connivens*);
- Masked Owl (*Tyto novaehollandiae*); and
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).

Table 2.2 shows the all ecosystem credit species that are predicted within each vegetation zone.

Table 2.2 Predicted ecosystem credit species

Scientific Name	Common Name	Tg Value	Predicted to occur within PCT/Vegetation Zone?								
			Zone 1 (HN526)	Zone 2 (HN526)	Zone 3 (HN526)	Zone 4 (HN528)	Zone 5 (HN528)	Zone 6 (HN528)	Zone 7 (HN529)	Zone 8 (HN529)	Zone 9 (HN594)
<i>Rostratula australis</i>	Australian Painted Snipe	1.3									Yes
<i>Ninox connivens</i>	Barking Owl	3.0	Yes			Yes			Yes		Yes
<i>Melithreptus gularis subsp. gularis</i>	Black-chinned Honeyeater (eastern subspecies)	1.3	Yes			Yes			Yes		
<i>Climacteris picumnus subsp. victoriae</i>	Brown Treecreeper (eastern subspecies)	2.0	Yes			Yes			Yes		
<i>Burhinus grallarius</i>	Bush Stone-curlew	2.6	Yes			Yes			Yes		Yes
<i>Stagonopleura guttata</i>	Diamond Firetail	1.3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	2.2	Yes			Yes			Yes		
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	2.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Petroica phoenicea</i>	Flame Robin	1.3	Yes			Yes			Yes		
<i>Stictonetta naevosa</i>	Freckled Duck	1.3									Yes
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	2.0	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	1.8									Yes
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	2.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Melanodryas cucullata subsp. cucullata</i>	Hooded Robin (south-eastern form)	1.7	Yes			Yes			Yes		
<i>Hieraaetus morphnoides</i>	Little Eagle	1.4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 2.2 Predicted ecosystem credit species

Scientific Name	Common Name	Tg Value	Predicted to occur within PCT/Vegetation Zone?								
			Zone 1 (HN526)	Zone 2 (HN526)	Zone 3 (HN526)	Zone 4 (HN528)	Zone 5 (HN528)	Zone 6 (HN528)	Zone 7 (HN529)	Zone 8 (HN529)	Zone 9 (HN594)
<i>Glossopsitta pusilla</i>	Little Lorikeet	1.8	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Tyto novaehollandiae</i>	Masked Owl	3.0	Yes			Yes			Yes		Yes
<i>Grantiella picta</i>	Painted Honeyeater	1.3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
<i>Ninox strenua</i>	Powerful Owl	3.0	Yes			Yes			Yes		Yes
<i>Petroica boodang</i>	Scarlet Robin	1.3	Yes			Yes			Yes		
<i>Chthonicola sagittata</i>	Speckled Warbler	2.6	Yes			Yes			Yes		
<i>Circus assimilis</i>	Spotted Harrier	1.4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	2.6	Yes			Yes			Yes		Yes
<i>Lophoictinia isura</i>	Square-tailed Kite	1.4	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Lathamus discolor</i>	Swift Parrot	1.3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Neophema pulchella</i>	Turquoise Parrot	1.8	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
<i>Daphoenositta chrysoptera</i>	Varied Sittella	1.3	Yes			Yes			Yes		Yes
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	2.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Targeted surveys for species credit species that were candidate species for the development site were undertaken in 2015. These species included fauna species Cumberland Plain Land Snail (*Meridolum corneovirens*), Regent Honeyeater (*Anthochaera phrygia*), Golden Bell Frog (*Litoria aurea*), Koala (*Phascolarctos cinereus*) and Squirrel Glider (*Petaurus norfolcensis*) as well as species credit flora species which included:

- *Acacia pubescens*;
- *Cynanchum elegans*;
- *Dillwynia tenuifolia*;
- *Dillwynia tenuifolia* - endangered population Kemps Creek;
- *Eucalyptus benthamii*;
- *Grevillea juniperina subsp. juniperina*;
- *Hypsela sessiliflora*;
- *Marsdenia viridiflora subsp. viridiflora* - endangered population;
- *Persicaria elatior*;
- *Persoonia bargoensis*;
- *Pilularia novae-hollandiae*;
- *Pimelea spicata*;
- *Pomaderris brunnea*; and
- *Wahlenbergia multicaulis* - endangered population.

24 Juniper-leaved Grevillea (*Grevillea juniperina subsp. juniperina*), a species credit species, were encountered within the Additional North-South Link Road Area on Fitzpatrick land. As the offsetting for the removal of these individuals forms part of the approvals for the development of the Fitzpatrick land (KMA, 2016), no further offsetting for these 24 individuals is considered in this BOS.

No other threatened flora species were identified within the development site. No species credit fauna species or populations have been assessed as impacted by the Project, therefore under the rules of the FBA, none will require offsetting.

2.1.3 Impacts that Require Further Consideration

Impacts of the Project that fall into the threshold of impacts that require further consideration comprise the removal of a total 2.50 ha of CEEC, which comprises 1.09 ha of HN528 and 1.41 ha of HN529. Of this, 0.80 ha of HN528 and 1.29 ha of HN529 comprises both TSC Act

listed and EPBC Act listed CEEC of Cumberland Plain Woodland while the remaining 0.29 ha of HN528 and 0.12 ha of HN259 is listed CEEC under the TSC Act only.

The impacts to HN528 and HN529 will be assessed by the consent authority through consideration of the information provided in *Section 7.4.2* of the Oakdale West Estate BAR (Cumberland Ecology, 2017). However, the required ecosystem credits to offset this PCT have been calculated and are also presented in **Table 2.3**.

2.2 Impacts of the Project that Require Offsetting

2.2.1 Native Vegetation

Impacts of the Project that fall into the threshold of impacts that require offsetting comprise:

- The removal of 1.27 ha of HU526 which comprises the River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC; and
- The removal of 1.68 ha of HU594 which comprises Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC.

The offset requirement for HN526 and HN594 were calculated using the BioBanking Credit Calculator (BBCC) Version 4.0 (OEH, 2014c). A summary of the vegetation zone impacted, threatened species associated with that vegetation zone, loss landscape value, loss in site value, and the number of ecosystem credits required for the impacts is detailed in the Oakdale West Estate BAR (Cumberland Ecology, 2017). A summary of the required ecosystem credits for each vegetation zone of the development site is shown in **Table 2.3**.

Table 2.3 Credit Requirement for the Project

Zone	PCT	Associated TECs and/or Ecosystem Credit Species	Loss in Landscape Value	Loss in Site Value Score	Required Ecosystem Credits
1	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions <i>Masked Owl</i>	12.80	28.65	15
2	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions <i>Yellow-bellied Sheathtail-bat</i>	12.80	28.65	7
3	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions <i>Yellow-bellied Sheathtail-bat</i>	12.80	28.65	9
4	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion <i>Barking Owl</i>	12.80	53.86	41
5	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion <i>Yellow-bellied Sheathtail-bat</i>	12.80	53.86	2
6	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion	12.80	53.86	5

Table 2.3 Credit Requirement for the Project

Zone	PCT	Associated TECs and/or Ecosystem Credit Species	Loss in Landscape Value	Loss in Site Value Score	Required Ecosystem Credits
	Plain, Sydney Basin Bioregion	<i>Yellow-bellied Sheath-tail-bat</i>			
7	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion <i>Barking Owl</i>	12.80	39.86	43
8	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion <i>Yellow-bellied Sheath-tail-bat</i>	12.80	39.86	4
9	Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions <i>Masked Owl</i>	12.80	65.22	88

Policy Framework of the Offset Strategy

The *NSW Biodiversity Offsets Policy for Major Projects* was adopted in September 2014 and applies to State Significant Developments (SSD) and State Significant Infrastructure (SSI) designated under the EP&A Act. 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 (NSW Government, 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.

3.1 Principles of Biodiversity Offsets for Major Projects

The *NSW Biodiversity Offsets Policy for Major Projects* provides a standard method for assessing impacts of major projects on biodiversity and determining offsetting requirements (NSW Government, 2014b). The policy is underpinned by six principles, which must be considered when assessing offsets for major projects. Details of the six principles and how the current application applies are discussed below.

- i. *Principle 1: Before Offsets Are Considered, Impacts Must First Be Avoided And Unavoidable Impacts Minimised Through Mitigation Measures. Only Then Should Offsets Be Considered For the Remaining Impacts*

Impacts of the project have been primarily avoided by locating the development site in areas that have a history of disturbance. 95% of the development site is located in exotic grassland

which will have negligible impacts to biodiversity. Unavoidable impacts of the Project will be minimised through on ground mechanisms at the construction phase, such as methods of clearing vegetation and having suitably qualified ecologist's onsite for clearing of fauna habitat. The BAR for the development site (Cumberland Ecology, 2015) details the avoidance and mitigation measures proposed for the Project.

ii. *Principle 2: Offset Requirements Should Be Based On a Reliable and Transparent Assessment of Losses and Gains*

The impacts of the Project have been assessed following a transparent assessment methodology, the FBA. The methods used to assess the impacts of the development site and gains at the offset site are clear and repeatable.

iii. *Principle 3: Offsets Must Be Targeted To the Biodiversity Values Being Lost or To Higher Conservation Priorities*

The offsets proposed have a direct relationship to the loss of biodiversity at the development site. All offsets proposed as part of this BOS are like-for-like offsets without any (permissible) deviations from the rules of offsetting outlined in the FBA. All impacts to PCTs at the development site will be offset using identical PCTs at the offset site.

iv. *Principle 4: Offsets Must Be Additional To Other Legal Requirements*

The proponent proposes to offset the impacts of the Project through establishment of a biobank site that is situated between the proposed Oakdale South Estate and proposed Oakdale West Estate. Although part of the proposed BioBank site includes land zoned as E2 – Environmental Conservation, the E2 land within the proposed BioBank site has no current management obligations. As the current tenure of the offset site has no existing legal requirements in relation to improvement of biodiversity, the compulsory management actions for the offset (biobank) site will be the primary legal obligation for the offset site.

A Riparian Corridor Assessment has been conducted to demonstrate compliance with the requirements of Office of Water Guidelines, even though those guidelines do not strictly apply to the Oakdale West Development given that it is a SSD and therefore does not require a controlled activity approval under the *Water Management Act 2000*. As all conservation/revegetation works in the riparian corridor will be conducted as part of the Biobank site, no discounts have been applied to the credit calculations.

v. *Principle 5: Offsets Must Be Enduring, Enforceable and Auditable*

By entering into a BioBanking Agreement at the offset site, the offset will be secured in perpetuity under a legally binding agreement. The offset site will not be allowed to be developed or impacted in any way, other than to achieve the management objectives as specified in the BioBanking Agreement. The offset site will be audited annually by OEH and will undergo third party assessment every 6 years as recommended by OEH auditors. The offset site will be funded by annual payments from the BioBanking Trust Fund as stipulated in the Part A payment schedule submitted with the BioBanking Agreement Application. The

total sum of the Part A payment will be paid by the proponent in full at the commencement date of the biobank site.

Where ecosystem credits cannot be generated at the Oakdale West Offset Site, the proponent will procure additional ecosystem credits and species credits from other biobank sites to ensure all offsets for the Project satisfy Principle 5 of the *NSW Biodiversity Offsets Policy for Major Projects*.

vi. *Principle 6: Supplementary Measures Can Be Used In Lieu Of Offsets*

If appropriate offsets cannot be found, proponents may provide funds for supplementary measures known to improve biodiversity values, such as:

- Actions outlined in threatened species recovery programs; or
- Actions that contribute to threat abatement programs; or
- Biodiversity research and survey programs; or
- Rehabilitating degraded aquatic habitat.

The total value to be contributed to supplementary measures would be commensurate to the costs of acquiring and retiring ecosystem credits, or establishment of a biobank site.

The Oakdale West Offset Site is expected to satisfy the majority of offsetting requirements of the project as detailed in **Section 4.5**. Any additional offsetting that is not secured at the proposed Oakdale West Offset Site is expected to be available within the BioBanking Credit market. As such it is not proposed to use additional or supplementary measures as part of this BOS.

Offset Site Identification

4.1 Proposed Offset Measures

This BOS proposes to establish an offset site adjacent to the development site secured under a BioBanking Agreement (the Oakdale West Offset Site) in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*.

4.2 Oakdale West Offset Site Details

4.2.1 Location

The Oakdale West Offset Site comprises two halves, both of which are located immediately adjacent to the development site as shown in **Figure 4.1**. The Oakdale West Offset Site and Development Site are both located within Penrith Local Government Area (LGA) and the nearest town centres are Erskine Park and Horsley Park which are both approximately 6 km west and east respectively. Immediately to the east of the eastern half of the Oakdale West Offset Site is the Onsite Offset Site that was described in the Biodiversity Offset Strategy for the Oakdale South Estate State Significant Development Application (Cumberland Ecology, 2016b) and will be subject to a separate BioBanking Agreement Application. For the purposes of this BOS, the ecosystem credits will be calculated for the offset lands within the Oakdale West Estate lot only (**Figure 4.1**); however, it is likely that the Oakdale South Onsite Offset Site will be utilised for any surplus ecosystem credits available following the Oakdale South Estate development.

The Oakdale West Offset Site will be accessed through the Oakdale West Development Site. The western part of the Oakdale West Offset Site consists of two remnant patches of woodland along the north-western boundary of the development site. The eastern part of the Oakdale West Offset Site is formed of one large intact area to the east of the power easement and one smaller area to the south of the adjoining power easements. The offset site is 16.05 ha in size and is wholly located within Lot 11 DP1178389.

4.2.2 General Description of Offset Site

i. Landform, Geology and Soils

Landform at the Oakdale West Offset Site is relatively uniform, primarily consisting of ephemeral creek lines along Ropes Creek, with adjacent areas of undulating rises and

alluvial flats then sharply rising along the western edge of the offset. The topography does not have any large variances like mountains or cliff lines.

ii. *Native Vegetation*

Native vegetation comprises approximately 42% of the vegetated cover of the Oakdale West Offset Site. Native vegetation within the eastern half of the Oakdale West Offset Site is primarily limited to the riparian corridor which fringes Ropes Creek and typically comprises regenerating stands of *Eucalyptus tereticornis* (Forest Red Gum) and *Casuarina glauca* (Swamp Oak) and remnant patches of Shale Hills and Shale Plains (Cumberland Plain) Woodland. The western half of the Oakdale West Offset Site comprises remnant patches of Shale Hills (Cumberland Plain) Woodland. The condition of vegetation within the offset site is degraded due to persistent impacts from grazing. Within areas of native vegetation, the ground layer is frequently dominated by exotic species, and the shrub layer is almost absent.

Field surveys have been undertaken at the Oakdale West Offset Site in areas of native vegetation in accordance with the methodology prescribed in the FBA (NSW Government, 2014a). A total of five full floristic plots and transects were undertaken across the Oakdale West Offset Site, to determine the PCTs present. PCTs were identified by assessing site data with the following criteria:

- IBRA subregion;
- Landscape position;
- Vegetation formation;
- Dominant canopy species (where present); and
- Dominant shrub and ground cover species.

Four PCTs have been identified at the proposed offset site (**Figure 4.2**) and are shown below:

- HN526 (moderate – good): Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion;
- HN528 (moderate – good): Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion;
- HN529 (moderate – good): Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion; and
- HN594 (moderate – good): Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion.

The remaining area of the Oakdale West Offset Site is cleared and improved for agriculture and is dominated by exotic pasture grasses in the form of Low Diversity/Exotic Grassland. For the purposes of this BOS, the proponent proposes to rehabilitate the remaining areas of

Low Diversity/Exotic Grassland within the Oakdale West Offset Site back to functional woodland with species typified by the PCTs HN526, HN528, HN529 and HN594. The PCT that regeneration of low condition grassland is expected to return to was based on a combination of surrounding PCTs, the native species present in grassland and the topographical position of the area in the landscape.

A summary of the areas of each PCT at the proposed offset site are shown in **Table 4.1**.

Table 4.1 PCTs at the Proposed Offset Site

PCT Number	PCT Name	Area (ha) within Offset Site
HN526 – Moderate -Good	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)	0.23
HN526 – Regeneration of low condition grassland	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)	1.66
HN528 - Moderate - Good	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528)	0.25
HN528 - Regeneration of low condition grassland	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528)	4.84
HN529 - Moderate - Good	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (HN529)	2.31
HN529 - Regeneration of low condition grassland	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (HN529)	1.38
HN594 - Moderate - Good	Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion (HN594)	3.96
HN594 - Regeneration of low condition grassland	Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion (HN594)	1.41
TOTAL		16.05

iii. Hydrology

The Oakdale West Offset Site occurs within the Hawkesbury-Nepean Catchment. The Oakdale West Offset Site occurs at the headwaters of the alluvial plain and is bisected by

Ropes Creek which converges with first order streams. Ropes Creek is a second order stream, which flows into South/Wianamatta Creek approximately 13 km north of the Oakdale West Offset Site. The drainage system within the offset site is in relatively poor condition, due to erosion and trampling by cattle.

iv. Land Uses

The Oakdale West Offset Site has previously been utilised for the purpose of cattle grazing. This land use has resulted in the 58% of the Oakdale West Offset Site being extensively cleared of vegetation which has resulted in a significant loss of flora and fauna habitats. Land surrounding the offset site has also historically been utilised for agricultural purposes.

The Oakdale West Offset Site has been primarily zoned E2 – Environmental Conservation under the WSEA SEPP (DoP (NSW), 2009) within a buffer about Ropes Creek. This buffer encapsulates the majority of the existing woodland vegetation within the offset site. Areas outside the Ropes Creek buffer are zoned as IN1 – General Industrial, as part of the WSEA SEPP. The objective of E2 – Environmental Conservation are to protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values; and to prevent development that could destroy, damage or otherwise have an adverse effect on those values. The objective of the IN1 - General Industrial zoning is to facilitate a wide range of employment-generating development including industrial, manufacturing, warehousing, storage and research uses and ancillary office space.

The lands immediately adjacent to the Oakdale West Offset Site will continue to be used as a power easement and further to the west and east as the new industrial developments which will include warehouses and associated infrastructure as detailed in the Oakdale West Estate BAR (Cumberland Ecology, 2017) and Oakdale South Estate S96 BAR (Cumberland Ecology, 2016a).

The Oakdale West Offset Site will form an important biodiversity corridor between the two developments linking up to the proposed Cumberland Conservation Corridor to the north and will provide refuge and commuting for many native fauna species.

4.2.3 Management Actions Proposed for the Offset Site to Improve Biodiversity Values

As part of this BOS, the following standard management actions have been identified for the Oakdale West Offset Site as prescribed in the BBAM (OEH, 2014a) and include the following obligations:

- Management of grazing for conservation;
- Weed control;
- Ecological fire management;
- Management of human disturbance;
- Retention of regrowth and remnant native vegetation;

- Replanting where natural regeneration is not sufficient;
- Retention of dead timber;
- Erosion control; and
- Retention of rocks.

These management actions will be undertaken at all vegetation zones at the Oakdale West Offset Site. In addition to the standard management actions listed above, the BBCC has prescribed additional management actions for each PCT at the Oakdale West Offset Site as detailed in **Table 4.2**. The location of each management zone is shown in **Figure 4.3**.

Table 4.2 Summary of Additional Management Actions at the Oakdale West Offset Site

Management Zone	PCT Name	Total Area (ha)	Additional Management Actions
1 (Existing) 2 (Regeneration)	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)	1.89	Exclude commercial apiaries Exclude miscellaneous feral species Feral and/or abundant native herbivore control Fox control Slashing
3 (Existing) 4 (Regeneration)	Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	5.09	Exclude commercial apiaries Exclude miscellaneous feral species Feral and/or abundant native herbivore control Fox control Slashing
5 (Existing) 6 (Regeneration)	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	3.69	Exclude commercial apiaries Exclude miscellaneous feral species Feral and/or abundant native herbivore control Fox control Slashing
7 (Existing) 8 (Regeneration)	Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	5.37	Exclude commercial apiaries Exclude miscellaneous feral species Feral and/or abundant native herbivore control Fox control

All management actions (including standard and additional actions) for the Oakdale West Offset Site will be described in full in a Biodiversity Assessment Report (BAR) for the offset site which will be produced at a later date. The BAR for the offset site will include a management plan which will stipulate in detail the management actions and reporting criteria for the offset site.

4.3 Improvement in Biodiversity Values at the Onsite Offset Site

The BioBanking Assessment Methodology (OEH, 2014a) was used to assess the Oakdale West Offset Site by calculating the gain in site value based on landscape values, site values, and proposed management actions at the Onsite Offset Site.

4.3.1 Ecosystem Credits Created at the Offset site

The change in site value at the Oakdale West Offset Site was calculated using the BBCC. Table of PCTs at the Oakdale West Offset Site and the number of ecosystem credits created is shown in **Table 4.3**. The credit calculator also generates a list of predicted ecosystem credit species utilising a number of variables which includes the following:

- IBRA subregion: Cumberland;
- Associated PCTs: HN526, HN528, HN529 and HN594;
- Percent native vegetation in outer assessment circle: 13.2%;
- Condition of vegetation: moderate to good (all vegetation zones);
- Patch size: 224.15 ha (all vegetation zones);
- Credit type: Ecosystem.

Based on the information above, the following ecosystem credit species with the highest Tg value are predicted at the Oakdale West Offset Site:

- Barking Owl (*Ninox connivens*);
- Masked Owl (*Tyto novaehollandiae*); and
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*).

Table 4.3 Summary of PCTs and Ecosystem Credits generated at the Oakdale West Offset Site

PCT	PCT Name and Associated Ecosystem Credit Species	Zone	Current site value	Future site value	Gain in site value	Ecosystem Credits Created
HN526	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	1	28.65	41.93	13.28	2
HN526	Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion N/A	2	9.38	22.92	13.54	14
HN528	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion <i>Barking Owl</i>	3	53.86	88.41	34.55	4
HN528	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion N/A	4	13.04	31.88	18.84	47
HN529	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion <i>Barking Owl</i>	5	39.86	66.18	26.32	29
HN529	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion N/A	6	13.04	31.88	18.84	13
HN594	Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion <i>Yellow-bellied Sheath-tail-bat</i>	7	65.22	87.68	22.46	47
HN594	Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion	8	21.74	46.01	24.27	16

Table 4.3 Summary of PCTs and Ecosystem Credits generated at the Oakdale West Offset Site

PCT	PCT Name and Associated Ecosystem Credit Species	Zone	Current site value	Future site value	Gain in site value	Ecosystem Credits Created
	and South East Corner Bioregion					
	N/A					

4.3.2 Species Credits Created at the Offset site

No species credits are predicted to be created at the Oakdale West Offset Site.

4.3.3 Justification for any Variation to the Offset Rules

Where suitable ecosystem credits cannot be acquired by the proponent, there are provisions within Section 10.5.4 of the FBA to allow for variations of the offsetting rules. Specifically for ecosystem credits, the consent authority may approve a variation of the offset rules for matching ecosystem credits by allowing ecosystem credits created for a PCT from the same vegetation formation as the required ecosystem credit to be proposed as part of the BOS, where in the consent authority's opinion the BOS demonstrates that:

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

The consent authority may also approve supplementary measures to be proposed as part of the BOS for a PCT impacted at the development site, where in the consent authority's opinion the BOS demonstrates that:

- All reasonable steps have been taken by the proponent to secure a matching ecosystem credit;
- The PCT to which a required ecosystem credit relates is associated with a CEEC/EEC or for which the impact of development does not require further consideration;

- The supplementary measure applies to that CEEC/EEC; and
- The supplementary measure is carried out in accordance with the rules of Appendix B of the NSW Biodiversity Offsets Policy for Major Projects.

This BOS does not propose to vary the offset rules for any PCT that will be impacted by the development of Oakdale West Estate.

4.3.4 Averted Loss at the Oakdale West Offset Site

Averted loss was calculated by assessing the risk of decline should the Oakdale West Offset Site not be secured under a conservation measure. The BBAM states in *Section 12.3.1.3* that:

“Native vegetation that has a high risk of decline in site value score is on lands that were or are zoned for residential (but not rural residential), business or industrial uses in a Local Environmental Plan (LEP) prior to the development of a Standard Instrument LEP (in accordance with the Standard Instrument (LEP) Order 2006), or land that is zoned RU1 (Primary production).”

The vegetation at the offset site is not considered to be at a high risk of decline as the lands have been zoned under the WSEA SEPP (2009) after the Standard Instrument LEP Order (DoP (NSW), 2006).

4.4 Securing the Oakdale West Offset Site

The offset site will be secured in perpetuity as a biobank site under a BioBanking Agreement. The offset site will be secured under the NSW BioBanking and Offset Scheme (the BioBanking Scheme) which establishes permanent objectives for biodiversity improvement on land under Part 7A of the TSC Act. Once established as a biobank site, the title holder of the Oakdale West Offset Site will be legally compelled to manage the land for biodiversity improvement as specified by the management actions within the BioBanking Agreement Application. The title holder of the biobank site will not be permitted to develop any part of the site, unless it is offset under the rules of offsetting prescribed within the BBAM (OEH, 2014a).

4.5 Credit Balance

Credit balance of the project shown in **Table 4.4** below. There are remaining deficits in credits for HN526, HN529 and HN594 impacted by the Oakdale West Estate project. As discussed in **Section 4.2.1**, it is likely that a surplus of credits at the Oakdale South Offset Site as described in the Oakdale South BOS (Cumberland Ecology, 2016b) and shown in **Table 4.5** will be utilised and, as such, the deficits for HN594 can be eliminated by using surplus credits available in the Onsite Offset Site as shown in **Table 4.6**. Part of the deficit for HN529 will be offset using the surplus of HN528 credits generated at the Oakdale West offset site.

The remaining credit deficit for HN526 and HN529 will be offset through the purchase of credits on the open market and then retired, as required.

As the Oakdale West Estate development is a staged development, BioBanking credits will be retired as required by that stage of earthworks; however, revegetation and management of the biobank site will commence from approval of the BioBanking Agreement.

Table 4.4 Credit Balance for Ecosystem Credits at the Oakdale West Offset Site

PCT Name	Area of Ecosystem Impact	Credits Required	Area within Offset Site	Ecosystem Credits Created	Credit Balance
HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	1.27	31	1.89	16	-15
HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	1.09	48	5.09	51	+3
HN529: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	1.41	50	3.69	42	-8
HN594: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	1.68	88	5.37	63	-25

Table 4.5 Credit Balance for Ecosystem Credits at the Oakdale South Offset Site

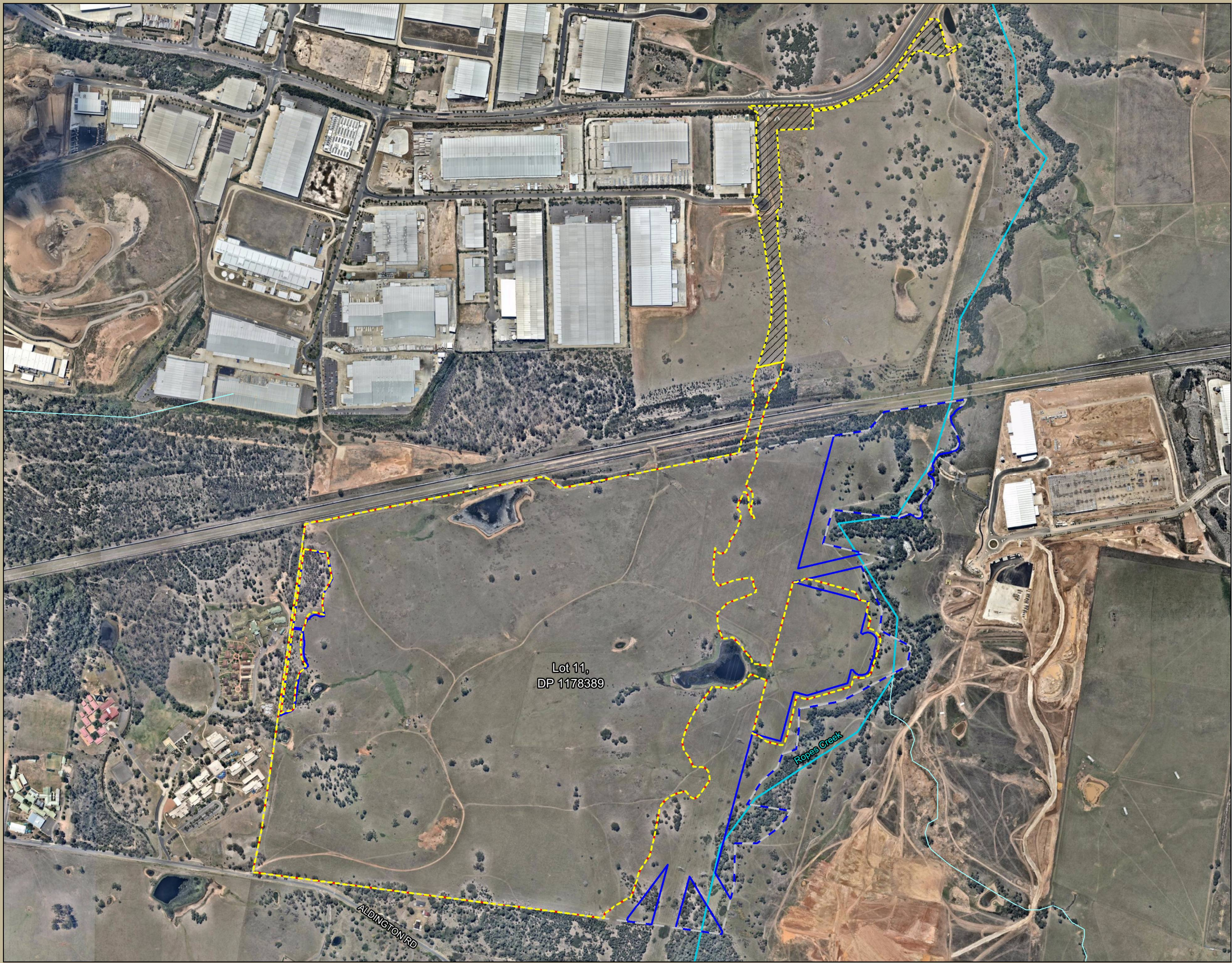
PCT Name	Area of Impact	Oakdale South Impact Credits Required	Area within Oakdale South Offset Site	Oakdale South Offset Ecosystem Credits Created*	Credit Balance remaining
HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	2.11	104	11.65	115	+11
HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	0.29	12	--	n/a – credits purchased	+1#
HN594: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	1.15	42	7.27	77	+35

* assumes credit balances and potential discount to credits in zones with 30m Riparian corridor as per proposed Oakdale South S.96 Mod 2 balances

indicates credit balance after accounted for purchased for Oakdale South Development

Table 4.6 Total Combined Credit Balance Remaining

PCT Name	Oakdale South Offset Credit Balance	Oakdale West Offset Credit Balance	Total Credit Balance
HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	+11	-15	-4
HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin	+1#	+3	+4
HN529: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	0	-8	-8
HN594: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion	+35	-25	+10



Legend

- Oakdale West Offset Site
- Development Site
- Additional North-South Link Road Area
- SSD Application Area
- Lot Boundary

Streams

- 1st Order Stream
- 3rd Order Stream

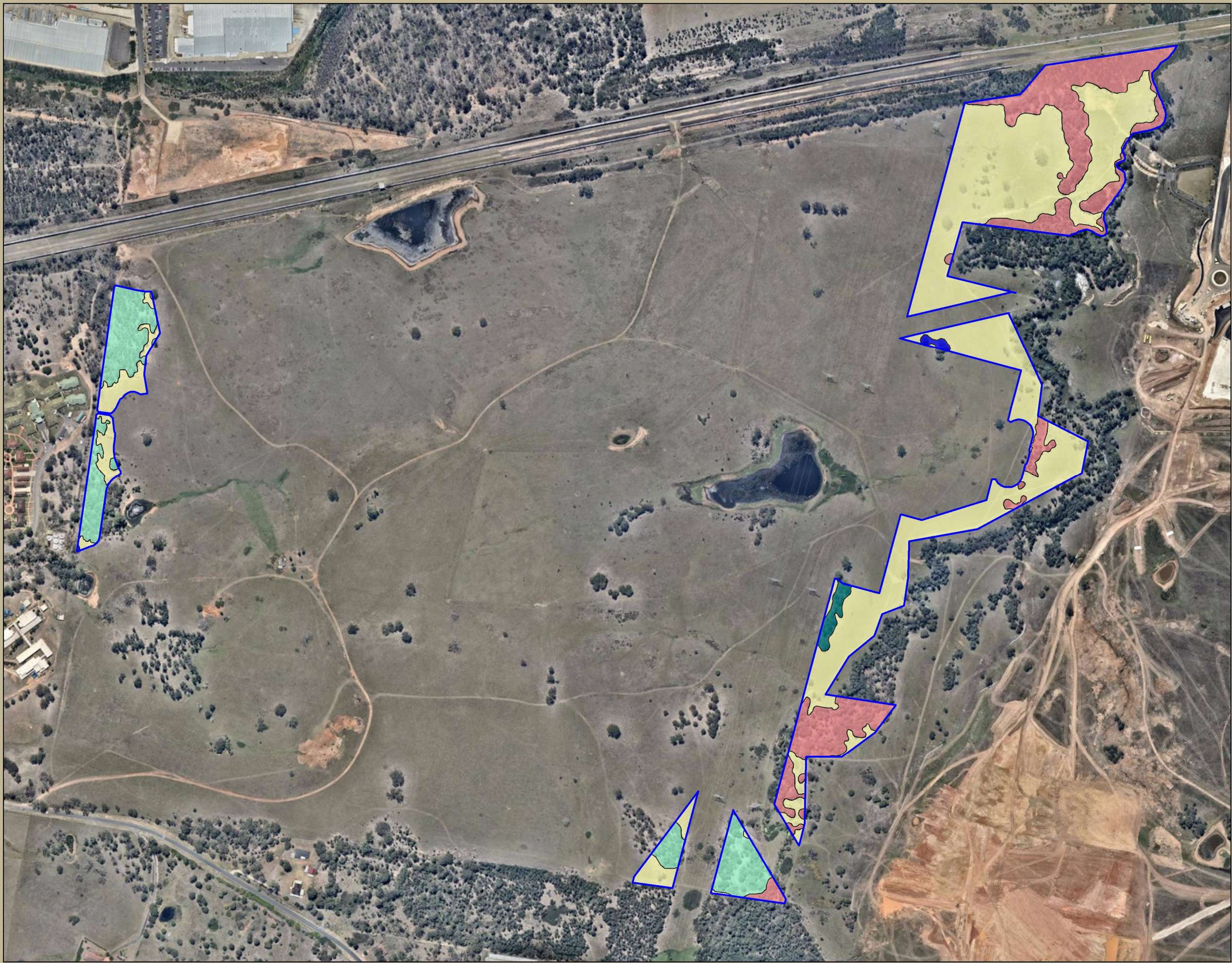
Image Source:
Image © Nearmap
(dated 11/02/2017)

Data Source:
Image © 2015
NSW Land and Property
Management Authority,
SIX Viewer
© Copyright Commonwealth of Australia
(Geoscience Australia) 2006



Figure 4.1. Location of the Oakdale West Offset Site





Legend

 BioBank Site

PCT

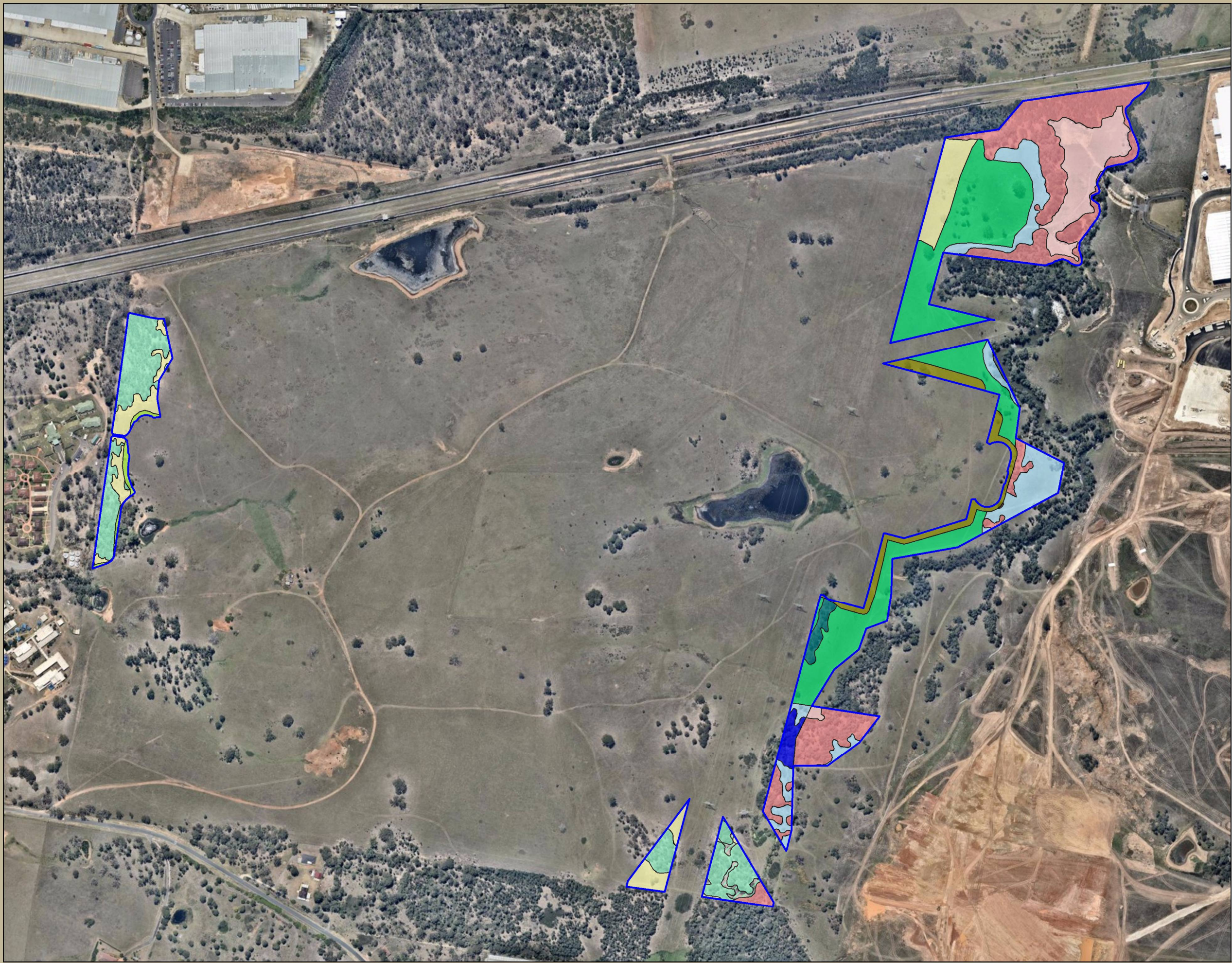
-  Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (HN526)
-  Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (HN528)
-  Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (HN529)
-  Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion (HN594)
-  Exotic Grasslands

Image Source:
Image © Nearmap
(dated 11/02/2017)



Figure 4.2. PCTs at the Oakdale West Offset Site





Legend

 Oakdale West Offset Site

Management Zone

 Zone 1: HN526

 Zone 2: HN526

 Zone 3: HN528

 Zone 4: HN528

 Zone 5: HN529

 Zone 5a: HN529

 Zone 6: HN529

 Zone 7: HN594

 Zone 8: HN594

 Zone 9: HN528

 Zone 10: HN529

Image Source:
Image © Nearmap
(dated 11/02/2017)

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



Figure 4.3. Management Zones at the Oakdale West Offset Site



Conclusion

This Biodiversity Offset Strategy has been drafted to propose and establish a commitment to offset the unavoidable impacts to native vegetation resulting from the development of Oakdale West Estate. This BOS has been prepared with the specific aim of satisfying the requirements to offset as specified within *Section 10* of the FBA (NSW Government, 2014a).

The objective of this BOS is to propose a Biodiversity Offset Package that will achieve a long term positive outcome for endangered species, populations and communities that will be impacted by the proposed development at Oakdale West Estate. The Project will have direct unavoidable impacts on four different native vegetation communities. These vegetation communities include:

- 1.27 ha of HN526: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (TSC Act Endangered Ecological Community);
- 0.80 ha of HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (TSC Act and EPBC Act Critically Endangered Ecological Community);
- 0.29 ha of HN528: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin (TSC Act Critically Endangered Ecological Community only);
- 1.29 ha of HN529: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (TSC Act and EPBC Act Critically Endangered Ecological Community);
- 0.12 ha of HN529: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (TSC Act Critically Endangered Ecological Community only); and
- 1.68 ha of HN594: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (TSC Act Endangered Ecological Community)

The impacts to PCT HN528 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin and HN529: Grey Box - Forest Red Gum grassy woodland

on shale of the southern Cumberland Plain, Sydney Basin Bioregion will require further consideration by the NSW Office of Environment and Heritage.

The offset for the impacts to *Grevillea juniperina* subsp. *juniperina* on Fitzpatrick land form part of the approvals for the development of the Erskine Park Employment Area and therefore no further offsetting for the 24 individuals located within the Link Road is required.

The BOS is guided by the NSW Biodiversity Offsets Policy for Major Projects (NSW Government, 2014b), and involves two potential offset measures for consideration:

- Establish an offset site adjacent to the development site secured under a BioBanking Agreement (the Onsite Offset Site); and
- Secure additional ecosystem credits for all PCTs not fully satisfied by the Onsite Offset Site.

Assessment using the BioBanking Assessment Methodology (OEH, 2014a), found that although the Oakdale West Offset Site provides credits for all impacted PCTs, a deficit will remain for HN526, HN529 and HN594.

The deficit of credits for the PCT HN594 Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion will be fully supplemented by the surplus credits created at the Oakdale South Offset Site (Cumberland Ecology, 2016b)

The majority of the deficit of credits for the PCT HN526 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin will be supplemented by the surplus credits created at the Oakdale South Offset Site (Cumberland Ecology, 2016b). The remaining deficit will be offset through the purchase of credits on the open market and then retired, as required

The deficit of ecosystem credits for HN529 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion will be partially offset through the substitution with the surplus of HN528 credits generated onsite. The remainder of the deficit will be offset through the purchase of credits on the open market and then retired, as required.

The Oakdale West Offset Site will be secured in perpetuity following approval of the development by preparing an Offset Site Biodiversity Assessment Report (BAR) and BioBanking Agreement Application for Oakdale West Offset Site. The BAR will stipulate the management actions as well as reporting requirements and completion criteria for each vegetation/management zone at the biobank site.

As the Oakdale West Estate development is a staged development, BioBanking credits will be retired as required by that stage of earthworks; however, revegetation and management of the biobank site will commence from approval of the BioBanking Agreement.

References

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- OEH (2014a). *BioBanking Assessment Methodology 2014*. Office of Environment and Heritage, Sydney.
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- OEH (2014c). *Online BioBanking Credit Calculator Version 4.0*. Office of Environment and Heritage, Sydney.

Appendix A

BioBanking Credit Calculator Report

BioBanking credit report



Office of
Environment
& Heritage

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 28/03/2017

Time: 1:25:50PM

Calculator version: v4.0

Biobank details

Proposal ID: 0057/2016/3941B

Proposal name: 15122 - Offset (V3=updated Veg)

Proposal address: PO Box 2474 Carlingford Court NSW 2118

Proponent name: Goodman Property Services (Aust) Pty Ltd

Proponent address: PO Box 2474 Carlingford Court NSW 2118

Proponent phone: 98681933

Assessor name: David Robertson

Assessor address: PO BOX 2474 Carlingford Court NSW 2118

Assessor phone: 02 9868 1933

Assessor accreditation: 0057

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

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	2.08	18.00
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	5.36	53.00
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	3.83	43.00
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	5.43	63.00
Total	16.70	177

Credit profiles

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

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

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

Number of ecosystem credits created	50
IBRA sub-region	Cumberland - Hawkesbury/Nepean

3. Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion, (HN529)

Number of ecosystem credits created	28
IBRA sub-region	Cumberland - Hawkesbury/Nepean

4. Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion, (HN529)

Number of ecosystem credits created	15
IBRA sub-region	Cumberland - Hawkesbury/Nepean

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

Number of ecosystem credits created	2
IBRA sub-region	Cumberland - Hawkesbury/Nepean

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

Number of ecosystem credits created	16
IBRA sub-region	Cumberland - Hawkesbury/Nepean

7. Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion, (HN594)

Number of ecosystem credits created	46
IBRA sub-region	Cumberland - Hawkesbury/Nepean

8. Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion, (HN594)

Number of ecosystem credits created	17
IBRA sub-region	Cumberland - Hawkesbury/Nepean

Species credits summary

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Exclude commercial apiaries
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Exclude miscellaneous feral species
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Fox control
Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Slashing
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Exclude commercial apiaries
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Exclude miscellaneous feral species
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Fox control
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Slashing
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Exclude commercial apiaries
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Exclude miscellaneous feral species
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Fox control
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Slashing
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Control of feral pigs
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Exclude commercial apiaries
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species

Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion

Feral and/or over-abundant native herbivore control

Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Fox control
Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion	Maintain or re-introduce natural flow regimes

BioBanking credit report



Office of
Environment
& Heritage

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 28/03/2017

Time: 1:24:13PM

Calculator version: v4.0

Biobank details

Proposal ID: 0057/2017/4292B

Proposal name: 15122 - Offset (Batters)

Proposal address: PO Box 2474 Carlingford Court NSW 2118

Proponent name: Goodman Property Services (Aust) Pty Ltd

Proponent address: PO Box 2474 Carlingford Court NSW 2118

Proponent phone: 98681933

Assessor name: David Robertson

Assessor address: PO BOX 2474 Carlingford Court NSW 2118

Assessor phone: 02 9868 1933

Assessor accreditation: 0057

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.86	8.00
Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	0.15	1.00
Total	1.01	9

Credit profiles

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

Number of ecosystem credits created	8
IBRA sub-region	Cumberland - Hawkesbury/Nepean

2. Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion, (HN529)

Number of ecosystem credits created	1
IBRA sub-region	Cumberland - Hawkesbury/Nepean

Species credits summary

Additional management actions