



Oakdale East Estate
SSD-37486043

Biodiversity Development Assessment
Report

prepared for

Goodman Property Services (Aust.) Pty Ltd

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Certification

I, Kat Duchatel (BAAS17054), certify that this biodiversity development assessment report has been prepared on the basis of the requirements of (and information provided under) the current biodiversity assessment method (OEH 2020).

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3	28/09/2022	Biodiversity Development Assessment Report_RTS amended	Goodman
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6	21/07/2023	Biodiversity Development Assessment Report_RTS amended	Goodman

Executive Summary

Background

SSD-37486043 seeks approval for a Concept Plan across Goodman's Oakdale East Industrial Estate ("Estate") and approval for Stage 2 of works at the Estate.

The site (subject land) is located within the Fairfield Local Government Area and is legally described as Lot 102 and Lot 103 in DP1268366.

Stage 1 of the works were completed in September 2021 and included Precinct 1 building and infrastructure works as indicated on the proposed Estate Masterplan.

The proposal is classified as a Part 4.1 State Significant Development (SSD-37486043) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This Biodiversity Development Assessment Report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs), which requires:

"An assessment of the proposal's biodiversity impacts in accordance with the Biodiversity Conservation Act 2016, including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted."

This BDAR has followed the Biodiversity Assessment Method 2020 (BAM) established under Section 6.7 of the NSW *Biodiversity Conservation Act 2016* (BC Act), which broadly requires an assessment of the following aspects:

- The type and condition of biodiversity values within the development footprint and wider subject land;
- Direct and indirect impacts on biodiversity values within the subject land;
- Any additional (prescribed) biodiversity impacts;
- Demonstration of how the hierarchy of 'avoid, minimise and mitigate' impacts has been applied;
- Quantification and description of the biodiversity credits needed to offset the residual impacts of a proposal on biodiversity values.

Subject land

The subject land assessed under this BDAR is located at 10 Old Wallgrove Road and is legally identified as Lot 102 and Lot 103 in DP1268366. Zoning of each lot is as follows:

- Lot 102: wholly zoned as IN1 - General Industrial; and
- Lot 103: predominantly zoned as IN1 but includes land zoned as C2 - Environmental Conservation along its eastern margin.

Land zoned as C2 represents remnant native vegetation associated with the riparian zone of Reedy Creek. Reedy Creek flows in a northerly direction from the southeastern corner to the north eastern corner of the subject land.

Lot 103 also contains a future infrastructure corridor, oriented north-west to south-east, which is located to the north of Precincts 3 and 4 and south of Precinct 5.

The subject land has been operated as a plant and quarry by Austral Bricks (Plant 3) for brick production since 1973, consequently most of the site is highly modified and disturbed terrain. The eastern boundary of the subject land is defined by Reedy Creek and remnant native riparian zone.

Four plant community types (PCTs) are present within the subject land:

1. Cumberland river-flat forest (PCT 835)
2. Cumberland shale plains woodland (PCT 849)

3. Cumberland swamp oak forest (PCT 1800)
4. *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071), which has been allocated to farm dam areas.

Fourteen ecosystem credits and ten species credits will be required to offset impacts from the clearing of 2.28ha of native vegetation and habitat for the *Callocephalon fimbriatum* (Gang-gang Cockatoo), as summarised below:

ID	Plant community type (PCT)	Area (ha)	Ecosystem credits
PCT 835	Cumberland river-flat forest - low to moderate condition	0.49	10
PCT 849	Cumberland shale plains woodland - planted	0.05	0
PCT 1071	<i>Phragmites australis</i> / <i>Typha orientalis</i> coastal freshwater wetland - artificial basins	0.13	3
PCT 1800	Cumberland swamp oak floodplain forest - low condition	1.15	0
PCT 1800	Cumberland swamp oak floodplain forest - moderate condition	0.03	1
Landscaping	n/a	0.43	0
		2.28	14

ID	Species name	Area (ha)	Species credits
Species	<i>Callocephalon fimbriatum</i> (Gang-gang Cockatoo)	0.49	10

Minimisation and avoidance of impacts

In accordance with Section 7.1.2 of the BAM, the proposal is, as far as practical, located as follows:

- In areas that have no biodiversity values; and
- In vegetated areas that:
 - are in the poorest condition, and/or
 - do not contain habitat for threatened species.

Most of the proposed clearing is located on land zoned IN1 (industrial), which consists of a former quarry subject to rehabilitation (under the approved DA 347.1/2021).

Less than 0.1 ha (983m²) of vegetation clearing will occur on land zoned as C2 (conservation), which consists of low-moderate condition vegetation growing on B horizon spoil mounds from past basin and spoil mound construction.

The disturbance to C2 zoned land is required for the construction of a private road that terminates at the northeastern corner of Precinct 4. The residual footprint of the road lies outside of C2 zoned land and the disturbed encroachment into C2 zoned land will not be permanent. Post-construction this area will be remediated and revegetated.

Approximately 5 ha of native vegetation is being conserved along the eastern boundary of Precincts 2, 4, and 5 as part of and in addition to the Reedy Creek riparian corridor.

Additional matters considered

No prescribed impacts would result from the proposal.

No Serious and Irreversible Impact (SII) entities would be impacted on from the proposal. PCT 849 is listed as an SII entity. However, within the subject land PCT 849 comprises approximately 0.05 ha of planted vegetation located on top of constructed containment cell, and was not identified as

an SAI entity by the BAM-C. A cumulative assessment of PCT 849 was undertaken across the subject land, which also concluded that the proposal will not significantly impact on an SAI entity.

Consideration of the Australian *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) has been undertaken. Three TECs listed under the EPBC Act within the subject land include the following:

- PCT 849 (Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest equivalent)
- PCT 835 (Coastal floodplain eucalypt forest of eastern Australia equivalent)
- PCT 1800 (Coastal Swamp Oak (*Casuarina glauca*) Forest of NSW and South East Queensland ecological community equivalent)

To be considered as a MNES area, the TEC must meet both key diagnostic and minimum condition thresholds as prescribed by the Australian Government (DAWE, 2020). None of the PCTs impacted meet the thresholds to be considered a MNES, primarily due to a lack of native perennial understorey species.

Assessment of threatened and migratory species listed under the EPBC Act has also concluded that the subject land is unlikely to provide habitat important to any threatened or migratory species.

Indirect impacts

The proposal's potential indirect impacts on biodiversity values will be mitigated through a range of measures, including but not limited to the following:

- Consideration of noise and light spill into fauna habitat during the design phase;
- Preparation and adherence to an Erosion and Soil Control Plan to prevent and sedimentation of retained native vegetation and Reedy Creek;
- Pre-clearance and clearance processes that will be documented within a Flora and Fauna Management Plan (FFMP), which will include, but not be limited to:
 - Pre-clearance and clearance management of vegetation;
 - Fauna rescue and relocation protocol;
 - Euthanasia protocol;
 - Basin decommissioning;
 - Weed and pathogen control; and
 - Monitoring and reporting strategies.
- Implementation of the Vegetation Management Plan for riparian restoration of native vegetation areas in to the Reedy Creek riparian zone; and
- Implementation of a Biosecurity Management Plan, which details the landowners' General Biosecurity Duty required under the *Biosecurity Act 2015*.

Contents

1. Introduction	1
1.1 Background	1
1.2 The proposal	1
1.3 Subject land	4
1.4 Information sources	6
1.4.1 Data and Imagery	6
1.4.2 Relevant surveys	6
1.5 Legislative context	8
2. Landscape Context	9
2.1 General description	9
2.2 Landscape features.....	10
2.2.1 IBRA bioregions and IBRA subregions	10
2.2.2 NSW landscape regions (Mitchell Landscapes)	10
2.2.3 Rivers / streams	10
2.2.4 Wetlands.....	10
2.2.5 Connectivity.....	10
2.2.6 Geological features	11
2.2.7 Outstanding biodiversity values	11
2.3 Native vegetation in BDAR assessment area	11
3. Native Vegetation	18
3.1 Plant community types	18
3.1.1 PCT 835: Cumberland riverflat forest	18
3.1.2 PCT 849 - Cumberland shale plains woodland	21
3.1.3 PCT 1800 - Cumberland swamp oak riparian forest.....	22
3.1.4 PCT 1071 Phragmites australia and Typha orientalis wetlands	24
3.1.5 Landscaping	24
3.1.6 Exotic vegetation.....	28
3.2 Threatened ecological communities	29
3.2.1 PCT 849 - Cumberland shale plains woodland	29
3.2.2 PCT 1071 - Phragmites australia and Typha orientalis wetlands	29
3.2.3 PCT 1800 - Cumberland swamp oak riparian forest.....	29
3.3 Patch size	31
4. Threatened species	33
4.1 Assessing habitat suitability for threatened species	33
4.1.1 Ecosystem credit species	33
4.1.2 Species credit species	33
4.1.3 Dual credit species.....	33

- 4.2 Identify candidate species for further assessment 33
 - 4.2.1 Ecosystem credit species 33
 - 4.2.2 Species credit species 35
- 4.3 Targeted field surveys 41
 - 4.3.1 Threatened flora species 41
 - 4.3.2 Threatened fauna species 42
- 5. Matters of NES 49
 - 5.1 Threatened ecological communities 49
 - 5.2 Threatened species 50
 - 5.3 EPBC Act referral process 53
- 6. Prescribed Impact Identification 53
 - 6.1 Water quality, water bodies and hydrological processes 54
 - 6.1.1 Water quality 54
 - 6.1.2 Hydrological processes 54
- 7. Avoid or Minimise Impacts 55
 - 7.1 Avoiding or minimising impacts on biodiversity values 55
 - 7.1.1 Avoiding or minimising impacts 55
 - 7.1.2 Direct impacts 55
 - 7.1.3 Indirect impacts 56
 - 7.2 Avoiding and minimising prescribed impacts 56
- 8. Assessing the impacts of the proposal on biodiversity values 57
 - 8.1 Direct impacts 57
 - 8.1.1 Native vegetation and habitat 57
 - 8.1.2. Change in Vegetation Integrity Score 57
 - 8.1.3. Landscaping 57
 - 8.2 Indirect impacts 59
- 9. Mitigating and managing impacts 64
 - 9.1 Flora and fauna management 64
 - 9.1.1 Pre-clearance 64
 - 9.1.2 Clearing 64
 - 9.1.3 Basin decommissioning 65
 - 9.2. Adaptive management for uncertain impacts 66
- 10. Thresholds for Assessment 67
 - 10.1. Impacts on serious and irreversible impacts 67
 - 10.2 Impacts that require an offset 68
 - 10.3. Impacts that do not require an offset 68
- 11. References 70
- Appendix A. Transect/plot data 71
- Appendix B. BAM summary reports 72

Appendix C. Vegetation Management Plan.....	73
Appendix D. Biosecurity Management Plan	74

Tables

Table 1-1. Response to SEARs	1
Table 1-2. Legislative context	8
Table 2-1. Subject land soil landscapes	9
Table 3-1. PCT 835 in the subject land impacted by proposal	18
Table 3-2. Selection process for PCT 835	19
Table 3-3. Selection process for PCT 849	21
Table 3-4. PCT 1800 in the subject land	22
Table 3-5. Selection process for PCT 1800.....	22
Table 3-6. TECs in the subject land.....	29
Table 3-7. Patch classes.....	31
Table 4-1. Ecosystem credit species	33
Table 4-2. Ecosystem species discounted from the BAM-C	35
Table 4-3. Species credit species.....	36
Table 4-4. Survey details.....	41
Table 4-5. Targeted threatened flora species	41
Table 4-6. Threatened fauna species surveyed (2018)	42
Table 4-7. Threatened fauna species surveyed (20210-2021)	43
Table 4-8. Threatened species recorded during surveys	44
Table 4-9. Green and golden bell frog surveys in the locality	45
Table 5-1. Threatened and migratory species returned from protected matters search report.....	50
Table 6-1. Prescribed and Uncertain Impacts	53
Table 8-1. Native vegetation clearing	57
Table 8-2. Change in vegetation integrity scores.....	57
Table 8-3. D.1 Decision-making key.....	58
Table 8-4. Assessment of indirect impacts	60
Table 9-1. Dam decommissioning requirements	65
Table 10-1.Cumulative impacts on PCT 849	67
Table 10-2. Ecosystem credit offsetting requirements	68
Table 10-3. Species credit offsetting requirements.....	68

Figures

Figure 1-1. SSD-37486043 layout (SBA, May 2022).....	3
Figure 1-2. Site context	5
Figure 1-3. Relevant studies.....	7
Figure 2-1. Subject land soils	12
Figure 2-2. IBRA Subregion.....	13
Figure 2-3. Mitchell Landscapes	14
Figure 2-4. Study area watercourses.....	15
Figure 2-5. Connectivity.....	16
Figure 2-6. Native vegetation in BDAR assessment area	17
Figure 3-1. Subject land PCTs.....	26
Figure 3-2. Landscaping plant schedule	27
Figure 3-3. TECs within the subject land	30
Figure 3-4. Patch sizes	32
Figure 4-1. Targeted threatened species surveys.	46
Figure 4-2. Green and golden bell frog surveys in the locality.....	47
Figure 4-3. Threatened species recorded	48
Figure 5-1. CPW diagnostic features and condition thresholds (adapted from DAWE guidelines, 2010)	49
Figure 10-1. PCTs and habitat areas that incur offsetting obligations.....	69
Figure 10-2. Areas that do not incur offsetting obligations.....	70

Glossary

BAM	NSW Biodiversity Assessment Method
BAM-C	BAM calculator
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BC Reg.	NSW <i>Biodiversity Conservation Regulation 2017</i>
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	NSW <i>Biodiversity Security Act 2015</i>
CEMP	Construction Environmental Management Plan
DA	Development Application
DCP	Development Control Plan
DCCEEW	Federal Department of Climate Change, Energy, the Environment and Water
DPE	NSW Department of Planning and Environment
EHG	Environment Heritage and Conservation Group of the DPE
EPBC Act	Commonwealth <i>Environment Protection Biodiversity and Conservation Act 1999</i>
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
GLA	Gross lettable area
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environment Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NRAR	NSW Natural Resource Access Regulatory
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
SEPP	NSW State Environment Protection Policy
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection

1. Introduction

1.1 Background

This Biodiversity Development Assessment Report (BDAR) has been prepared to support a State Significant Development (SSD) application for a Concept Plan for the Oakdale East Estate (OEE) and development consent for Stage 2 works at 2-10 Wallgrove Road, Horsley Park.

The Planning Secretary’s Environmental Assessment Requirements (SEARs) as relevant to biodiversity are summarised in Table 1-1 below.

Table 1-1. Response to SEARs

SEARs requirement	Where addressed in this BDAR
An assessment of the proposal’s biodiversity impacts in accordance with the <i>Biodiversity Conservation Act 2016</i> and the Biodiversity Assessment Method (BAM), including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted	Purpose of this BDAR. A BDAR waiver has not been sought
An assessment of long-term impacts of detention basins and spill into Reedy Creek	Section 6.1.2 and Table 8-4 in Section 8.2
Impacts from ancillary infrastructure and noise and lighting impacts on fauna during Operation	Table 8-4 in Section 8.2
A vegetation management plan for the Reedy Creek riparian corridor through the site	Provided in Appendix C.
A biosecurity management plan	Provided in Appendix D

Since the SSD application was lodged with the Department of Planning and Environment (DPE), the OEE Concept Plan and Stage 2 works have been amended.

The proposed amendments do not result in any further impacts on biodiversity values beyond those assessed in the previously submitted BDAR (17 March 2023) for SSD 37486043.

This BDAR has been updated to include the amendments and be consistent with

1.2 The proposal

The proposed Concept Plan seeks approval for:

- Development of ten warehouses within Precincts 2, 3, 4 and 5, plus the extension of a building in Precinct 1
- Access to the lots via two Estate Roads with a private access road servicing warehouses in Precinct 4
- The Estate masterplan allowing development of an additional 294,982 sqm of GLA (creating an Estate GLA of 333,754 sqm);
- 24/7 hours of operation;
- Building Height of 43m for Precinct 3 (excluding roof-top plant and solar) and 15m (excluding roof-top plant and solar) to the remainder of the Estate
- Estate subdivision
- Estate wide planning controls as shown in the EIS

- Construction hours 7 am to 6 pm Monday to Friday, 8 am to 1 pm Saturday
- Geotech and Aboriginal heritage considerations for Precinct 5

Stage 2 works include:

- Cut and fill works to Precinct 5 only to provide bulk pad level
- Completion of lead-in infrastructure works including intersection upgrades at Millner Ave / Old Wallgrove Road and Lenore Drive / Old Wallgrove Road
- Clearing of 2.28 ha of native vegetation
- Completion of the internal road network (incl. the proposed private driveway providing permanent access to Precinct 4 but excluding any access to Precinct 5 through the transmission easement)
- Reticulation of services infrastructure to provide serviced development pads to all precincts
- Completion of retaining walls across the entire Estate
- Completion of Building works to Precinct 1 expansion and Precinct 3 including any ancillary on lot infrastructure and detailed civil works required
- Precinct 1 Expansion:
 - Construction, operation, fit-out and use approval of a warehouse with ancillary office spanning 3,122 m² of GLA;
 - 24/7 hours of operation;
 - 15m building height (excluding solar and rooftop plant).
- Precinct 3 works:
 - Construction, operation, fit-out and use approval of multiple warehouses for distribution use with ancillary office spaces spanning a total of 120,664 sqm of GLA;
 - 24/7 hours of operation;
 - 14.6m building height (excluding solar and rooftop plant).

Figure 1-1 illustrates the proposed SSD Master Plan layout.

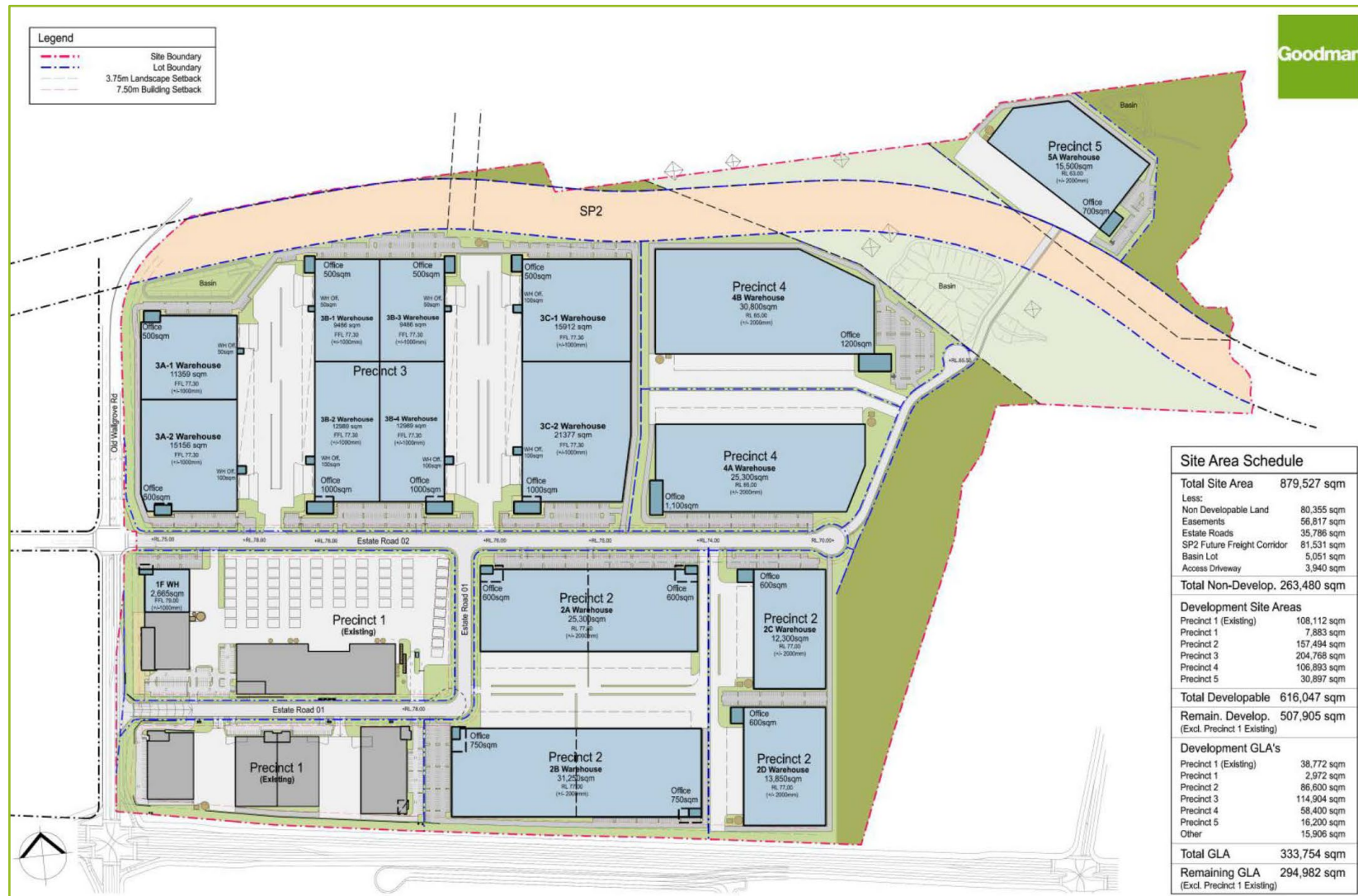


Figure 1-1. SSD-37486043 Estate Masterplan (SBA, 24 May 2023)

1.3 Subject land

The subject land assessed under this BDAR is located at 10 Old Wallgrove Road and is legally identified as Lot 102 and Lot 103 in DP1268366. Zoning of each lot is as follows:

- Lot 102: wholly zoned as IN1 - General Industrial; and
- Lot 103: predominantly zoned as IN1 but includes land zoned as C2 - Environmental Conservation along its eastern margin.

Land zoned as C2 represents remnant native vegetation associated with riparian zone of Reedy Creek. Reedy Creek flows in a northerly direction from the southeastern corner to the northeastern corner of the subject land.

Lot 103 also contains a future infrastructure corridor, oriented north-west to south-east, which is located to the north of Precincts 3 and 4 and south of Precinct 5 (see Figure 1-2).

The subject land has been operated as a plant and quarry by Austral Bricks (Plant 3) for brick production since 1973. Consequently, the subject land, excluding the Reedy Creek riparian zone, contains highly modified and disturbed terrain.

The subject land has been the subject of various biodiversity assessments over the past three years, summarised as follows:

- Lot 102 - an approved BDAR for the recently developed Stage 1 under DA approval (DA 133.2/2019);
- Lot 103 - an approved DA (DA85/2019) for the relocation of Plant 3's crusher, (to enable Stage 1 development to proceed); and
- Lot 103 - a supporting BDAR for DA/347.1/2021, which has been reviewed and amended to the satisfaction of Council.

Figure 1-2 illustrates the subject land in the context of vegetation approved for clearing under DA 133.2/2019 and DA/347.1/2021, along with the proposed vegetation clearing associated and SSD-37486043.

Oakdale East Estate SSD-37486043

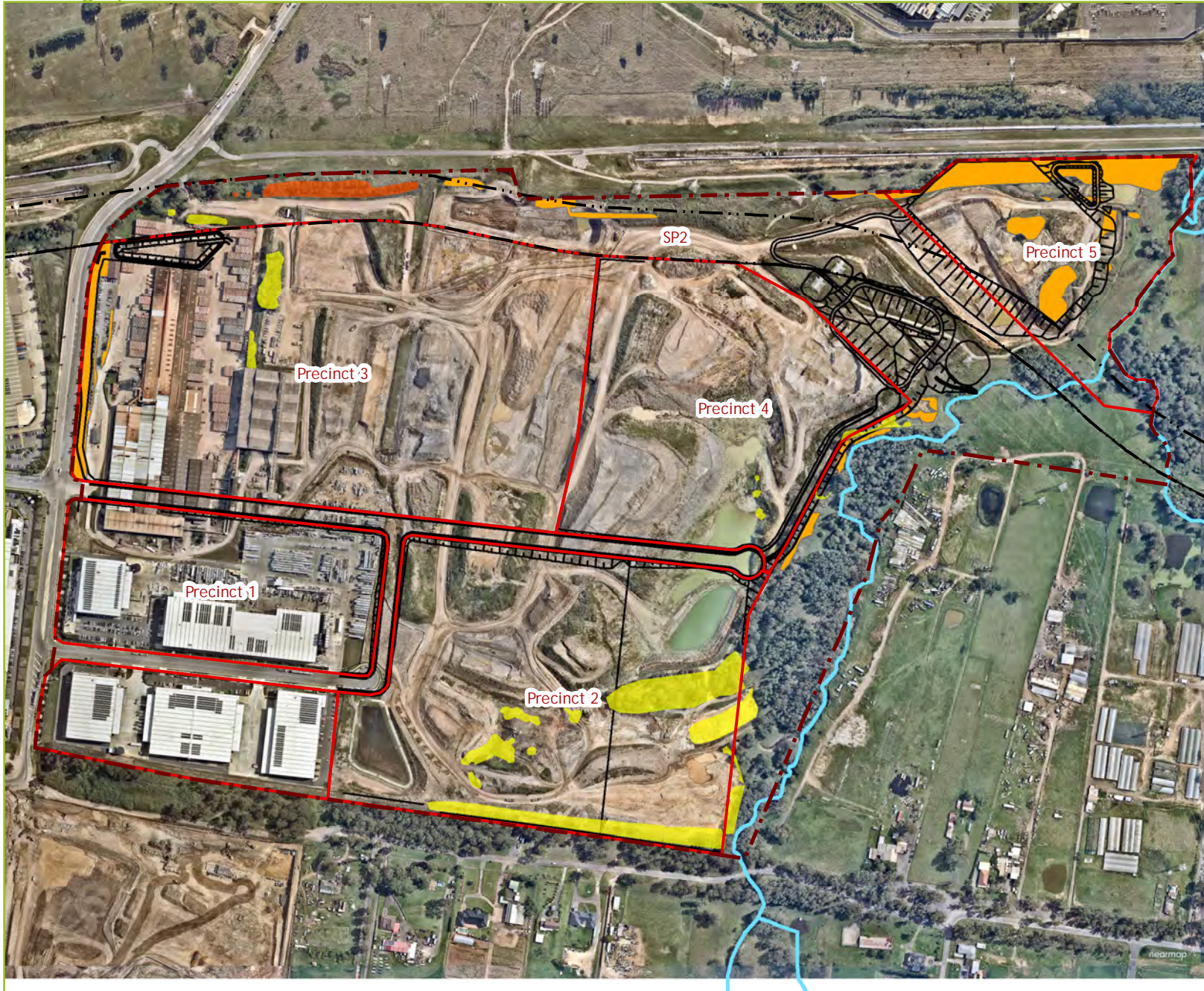
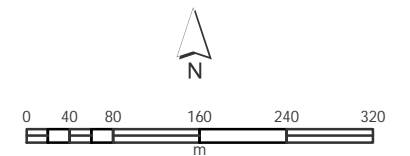


Figure 1.2. Site context

Legend

- Site_boundary
- Precincts
- SP2
- Vegetation clearing
 - DA/347.1/2021 approved
 - DA/85/2019 approved
 - Vegetation clearing Under SSD
- Reedy Creek



Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 3 February 2022
Date prepared: 26 June 2023

1.4 Information sources

The following information sources were used in the preparation of this report:

1.4.1 Data and Imagery

- Imagery:
 - Aerial imagery: NearMap 7 June 2022
- Australian Government Department of the Environment and Energy
 - Protected Matters Search Tool <http://www.environment.gov.au/epbc/pmst/index.html>
 - Species Profiles and Threats Database (SPRAT) <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
 - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (Department of the Environment, Water, Heritage, and the Arts, 2013 EPBC Act Policy Statement)
 - Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0
- NSW Department of Planning, Industry and Environment (DPIE), Environment, Energy and Science (EES) Group, formerly the Office of Environment and Heritage (OEH)
 - NSW (Mitchell) Landscapes - version 3.1
 - BVMap_BV13_Web.gdb
 - Biodiversity Values Map and Threshold Tool
 - Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207
 - BioNet Vegetation Classification Database and Threatened Biodiversity Data Collection
 - Biodiversity Investment Opportunities Map: Mapping Priority Investment Areas for the Cumberland Subregion (2018)
 - Department of Environment and Climate Change, 2008, Soil and Land Resources of the Hawkesbury-Nepean Catchment, Department of Environment and Climate Change, Sydney.

1.4.2 Relevant surveys

Past biodiversity surveys relevant to the subject land assisted in assessing the known or likelihood of threatened species, populations, and ecological communities to occur within the subject land and the general locality.

Relevant studies reviewed included the following and are shown in Figure 1-3:

- écologique (2022) Austral Brick Plant 3 Rehabilitation BDAR
- écologique (2020) Biodiversity Assessment Report - Oakdale East Industrial Estate Stages 2-5
- écologique (2019) Oakdale East Industrial Estate Stage 1 BDAR
- écologique (2019) Austral Brick Plant#3 Crusher Relocation (DA) Biodiversity Assessment
- écologique (2018) Biodiversity Assessment Report - Oakdale East DCP
- Cumberland Ecology (2016a) Oakdale West Estate (SSDA) BDAR
- Cumberland Ecology (2016b) Oakdale South Estate (SSDA) BDAR
- Travers Bushfire and Ecology (2014) Ecology and Flora and Fauna Assessment CSR Brick Plant
- Cumberland Ecology (2007) Ecological Assessment - Oakdale Industrial Estate Concept Plan (Major Project)

Oakdale East Estate SSD-37486043

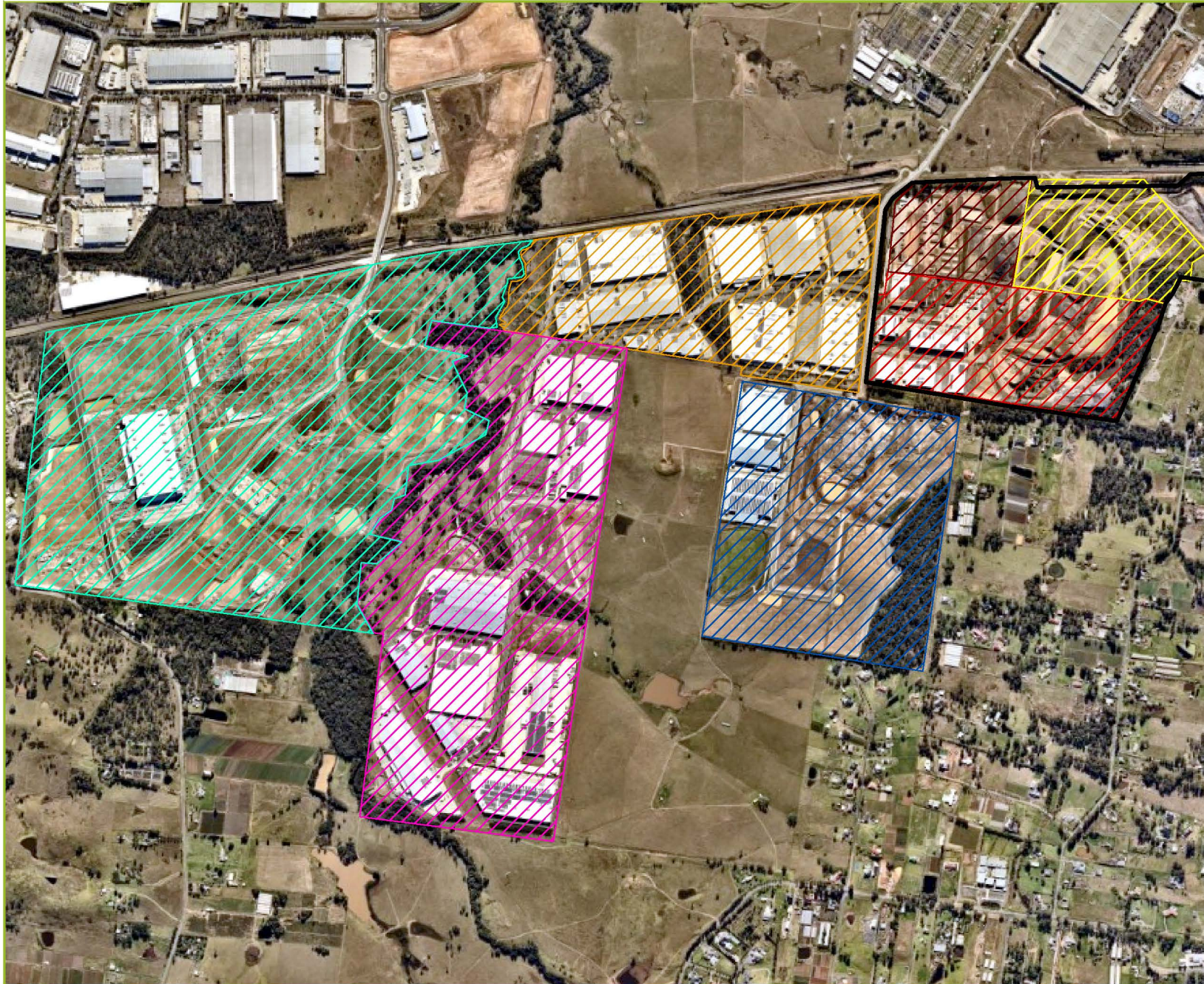








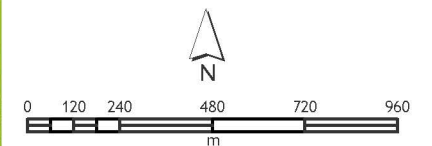


Figure 1.3.
Relevant surveys

Legend

-  Subject land
-  Oakdale East DA 85/2019
-  Oakdale East DA 133.2/2019
-  Oakdale East DA 347.1/2021
-  Oakdale Central Estate
-  Oakdale South Estate
-  Oakdale West Estate
-  CSR Brick Plant



Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 5 June 2021
Date prepared: 22 February 2022

1.5 Legislative context

Table 1-2 provides a summary of legislation relevant to biodiversity matters on the subject land.

Table 1-2. Legislative context

Legislative mechanism	Relevance to proposal
Federal	
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	<p>The EPBC Act is the Australian Government’s central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places – defined in the EPBC Act as matters of national environmental significance (MNES).</p> <p>MNES within the subject land, are discussed in Section 5.</p>
State	
<i>Biodiversity Conservation Act 2016</i> (BC Act)	<p>The BC Act together with the <i>Biodiversity Conservation Regulation 2017</i> (BC Reg.), outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (the Scheme).</p> <p>Despite the highly modified nature of the subject land, several areas of remnant and planted native vegetation will be cleared for the works. Clearing of this vegetation triggers entry into the NSW Biodiversity Offsets Scheme (the Scheme), which requires proponents to provide the following:</p> <ul style="list-style-type: none"> • An assessment the proposal’s biodiversity impacts through application of the Biodiversity Assessment Method (BAM); and • A Biodiversity Assessment Development Report (BDAR) that documents how: <ul style="list-style-type: none"> ○ Impacts on biodiversity will be avoided and minimised, and ○ Remaining residual impacts that cannot be avoided will be offset (through the credit obligation generated from application of the BAM). <p>This BDAR sets out how the proponent has applied steps to avoid and minimise impacts on biodiversity and sets out the number and type of ecosystem and species credits required to offset residual impacts of the activity on biodiversity values.</p>
<i>Fisheries Management Act 1994</i> (FM Act)	<p>Reedy Creek along the eastern boundary of the subject area is not mapped as key fish habitat (KFH) and the proposal will not impact on any fishery resources as defined under the FM Act, nor involve any activities that require approval under the FM Act.</p>
<i>Water Management Act 2000</i> (WM Act)	<p>The WM Act is administered by DPE Water (formerly Natural Resources Access Regulator) and establishes an approval regime for activities within waterfront land, defined as the land 40 m from the highest bank of a river, lake, or estuary.</p> <p>Development within Precincts 2, 4 and 5 within the subject land are partially located on waterfront land.</p> <p>Impacts on waterfront land within Precincts 2 and 4 were referred to DPE Water via the approved DA/347.1/2021 (by Fairfield Council).</p> <p>Impacts on waterfront land within Precinct 5 are addressed in the Vegetation Management Plan (VMP) that specifies how the protection and restoration of a riparian corridor will be achieved. The VMP is provided in Appendix C.</p>

2. Landscape Context

2.1 General description

The subject land is mapped as overlying disturbed terrain, Blacktown and South Creek soil landscapes in the following locations:

- **Precinct 5:** Blacktown and South Creek soil landscapes, although predominantly disturbed terrain through quarrying activities.
- **Precinct 3:** disturbed terrain
- **Future freight corridor:** disturbed terrain and Blacktown soil landscape and South Creek soil landscapes, although areas overlying Blacktown soil landscapes are disturbed terrain through quarrying activities and construction of the adjacent Warragamba pipelines.

Soil landscape characteristics are summarised in Table 2-1 and shown in Figure 2-1.

Table 2-1. Subject land soil landscapes

BLACKTOWN	Landscape	Low hills and rises on Wianamatta Group Shale (shale, sandstone-lithic and sandstone-quartz) in the Cumberland Plain, Hornsby Plateau and Picton Hills. Local relief 10-50 m; altitude 10-202 m; slopes 0-9%; rock outcrop nil. Extensively cleared woodland.
	Soils	Red Kurosols (Red and Brown Podzolic Soils) Red and Yellow Sodosols (Soloths) and Yellow Chromosols (Yellow Podzolic Soils). Red Chromosols, Red Dermosols and Red Ferrosols (Krasnozems) on iron-rich parent material.
	Vegetation	Extensively cleared. Two distinct vegetation units. Closer to the coast the vegetation is dominated by wet sclerophyll forest (tall open forest) with this grading into dry sclerophyll forest (open woodland) to the west as rainfall declines. The dry sclerophyll forest is dominated by Shale Plains Woodland with minor occurrences of Shale Hills Woodland.
	Land degradation	Some saline scalds occur mainly at breaks in slope and in lower slope positions where drainage has been significantly altered. At many sites, the A1 horizon has been eroded (sheet erosion), leaving an organically influenced A2 horizon exposed as topsoil.
	Hazards	Localised salinity, low fertility, foundation movement hazards and sheet and gully erosion hazards
SOUTH CREEK	Landscape	Flood plain on Quaternary Alluvium (alluvium, shale, sand and silt) in the Cumberland Plain. Local relief 0-10 m; altitude 3-159 m; slopes 0-3%; rock outcrop nil. Extensively cleared open forest.
	Soils	Grey, Yellow and Brown Chromosols (Grey, Red, Brown Podzolic Soils), Black and Brown Dermosols (Prairie Soils) and Tenosols (Alluvial Soils).
	Vegetation	Original vegetation has been extensively cleared. Described as Alluvial Woodland and River-flat Forest. There is usually an upper tree stratum and a lower tree stratum and a sparse shrub stratum and dense ground cover.
	Land degradation	Highly modified, active fluvial area with many areas of fluvial erosion (including streambank erosion) and deposition. Post-settlement alluvium often overlies buried soil horizons. Subsoils are sometimes saline, and this is evident in surface scalds where water tables are close to the surface.

Hazards

Localised seasonal waterlogging, salinity, fertility and foundation hazards, sheet and gully erosion and permanent waterlogging.

Widespread flood hazard and streambank erosion.

2.2 Landscape features

Landscape features relevant to the proposal have been assessed from within a 1500m buffer zone (the BDAR assessment area) around the proposed development site (subject land).

In accordance with Sections 3.1 and 3.2 of the BAM (2020) assessment and mapping of the following landscape features are required:

- IBRA bioregions and subregions;
- NSW (Mitchell) landscapes;
- Rivers and streams classified according to stream order;
- Wetlands within, adjacent to and downstream of the site;
- Connectivity of different areas of habitat;
- Geological features such as karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features;
- Areas of outstanding biodiversity value occurring on the subject land and assessment area; and
- Percent native vegetation cover in the assessment area.

2.2.1 IBRA bioregions and IBRA subregions

The subject land and BDAR assessment area are wholly located within the Sydney Basin IBRA region and Cumberland IBRA subregion (see Figure 2-2)

2.2.2 NSW landscape regions (Mitchell Landscapes)

The subject land is located wholly within the Cumberland Plain landscape. The only other NSW landscape is a small area of Sydney Basin Diatreme occurs, which covers approximately 1.3% of the BDAR assessment area (see Figure 2-3).

2.2.3 Rivers / streams

Two creeks (Reedy Creek and Ropes Creek) occur within the BDAR assessment area as shown in Figure 2-4. Ropes Creek is located approximately 1.3 km to the west of the subject land and will not be disturbed as a result of the proposal.

The subject land's eastern boundary is contiguous with the riparian zone of Reedy Creek, where it is a third order Strahler stream (see Figure 2-4).

2.2.4 Wetlands

No wetlands of local, regional, national or international significance are located within the subject land or BDAR assessment area.

2.2.5 Connectivity

The subject land does not contain any regionally important biodiversity corridors but provides connectivity from south to north within the Reedy Creek riparian corridor. An area of mapped Cumberland subregional corridor occurs within the BDAR assessment area but will not be impacted by the proposal (see Figure 2-5).

2.2.6 Geological features

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the BDAR assessment area.

2.2.7 Outstanding biodiversity values

No outstanding biodiversity values occur within the BDAR assessment area. Figure 2-5 shows High Biodiversity Value mapping provided under the BC Reg.

2.3 Native vegetation in BDAR assessment area

Native vegetation cover on the subject land must be assessed in relation to native vegetation cover across a broader area.

The cover of native vegetation within the BDAR assessment area is required to determine the context of the site. The cover of native vegetation in the BDAR assessment area, was assessed as follows:

- Clipping the extent of Cumberland Plain Vegetation Mapping (OEH 2013) within the BDAR assessment area using ArcMap v10.8.2;
- Editing the shapefile to remove areas of vegetation no longer evident and increase the extent of vegetation, along with the addition of polygons identifying areas of vegetation not represented in mapping.

Figure 2-6 illustrates the extent of native vegetation within the BDAR assessment area.

The BDAR assessment area including the subject land is 1,406.9 ha. The total of native vegetation cover within the BDAR assessment area is estimated at 156.4 ha, which equates to 11% and an assignment to the 10-30% cover class (in accordance with the BAM Section 3.2).

Oakdale East Estate SSD-37486043

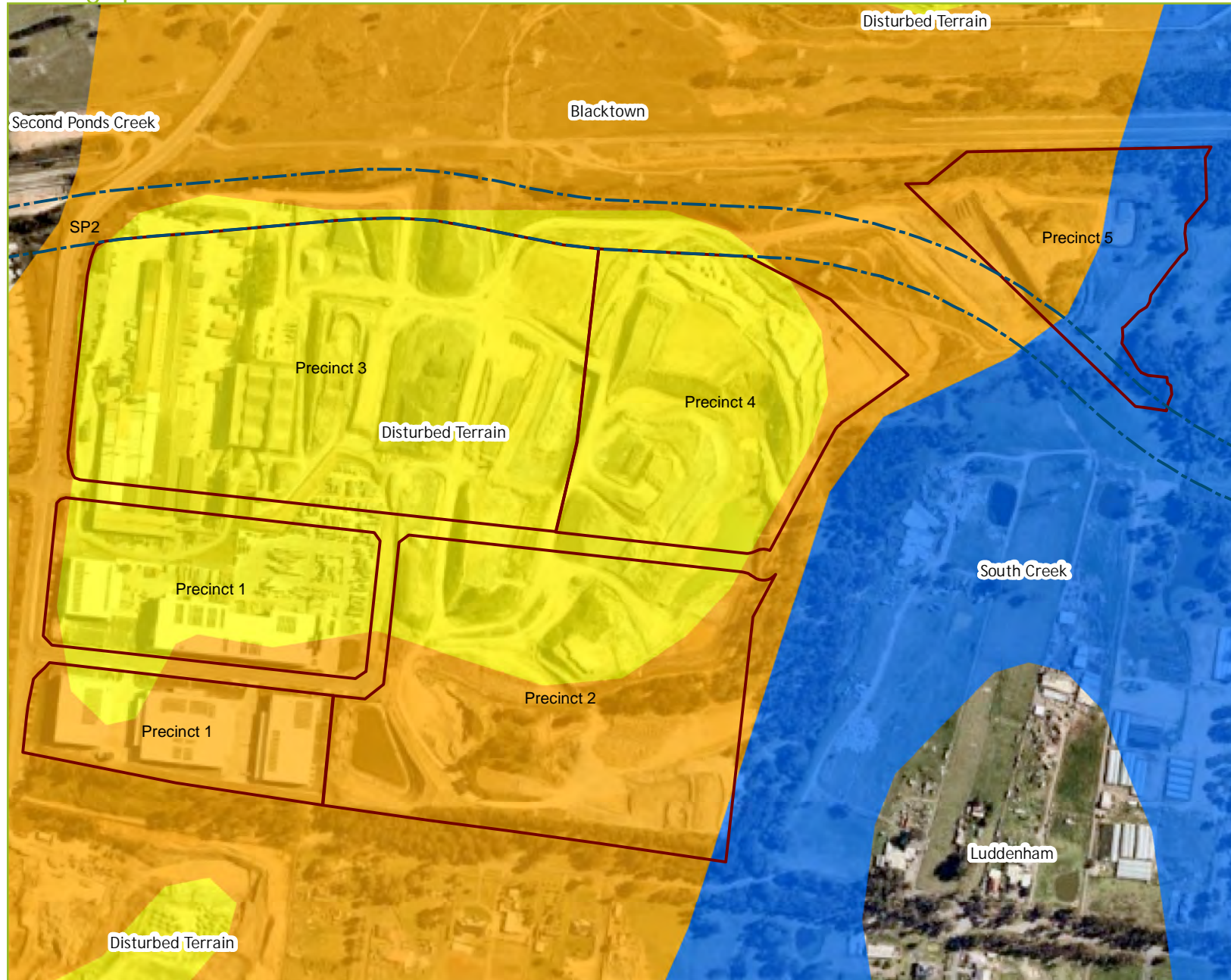
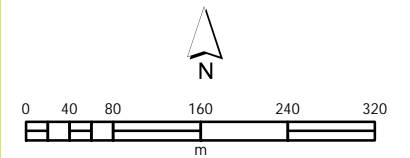


Figure 2-1.
Subject land soils

Legend

- Precincts
- Future freight
- Blacktown
- South Creek
- Disturbed Terrain

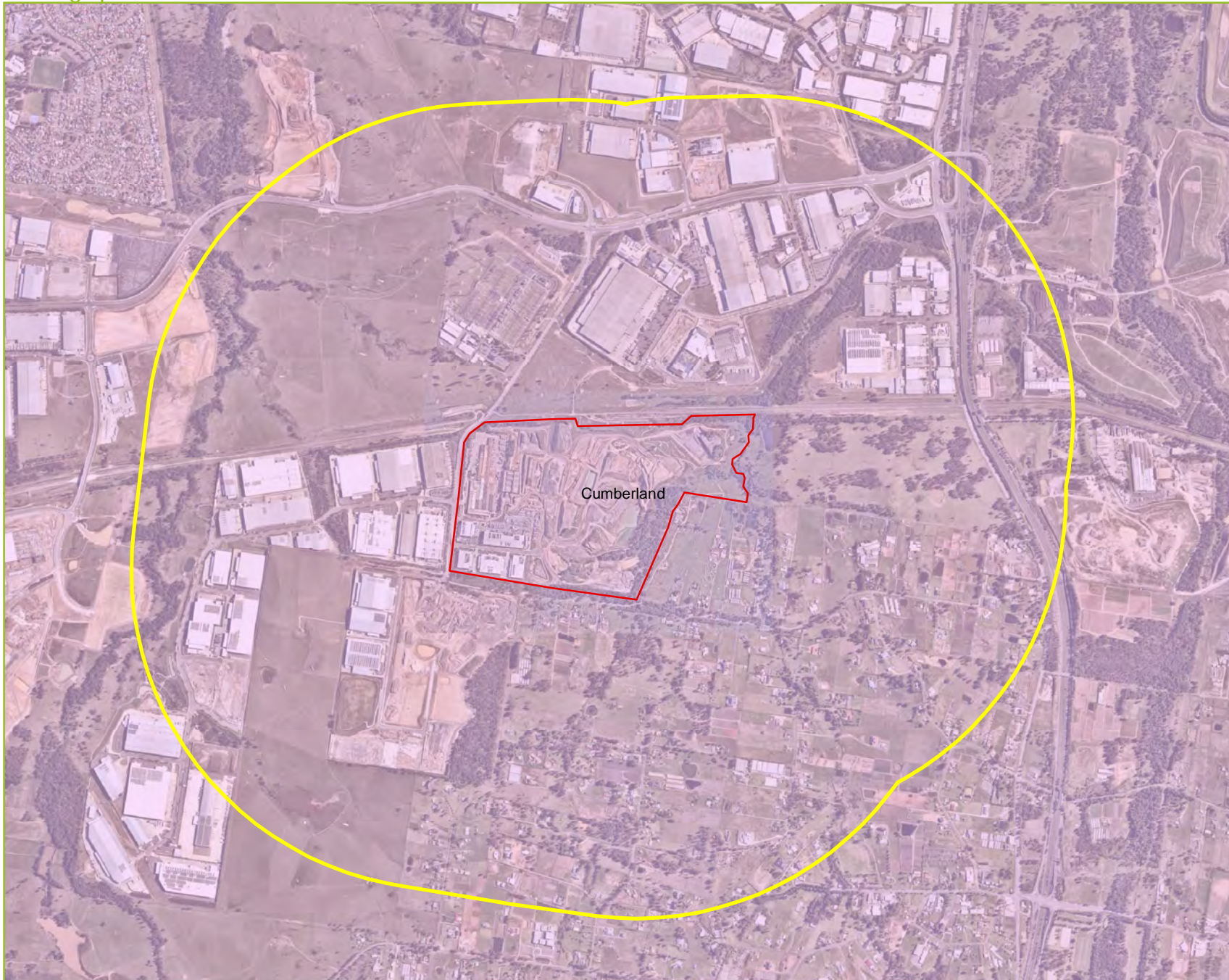


Coordinate System: MGA Zone 56 (GDA 2020)

Image sources: Nearmap 17 October 2021

Data sources: HNP_SLR100K_v1_1_GDA94




Date drawn: 22 February 2022

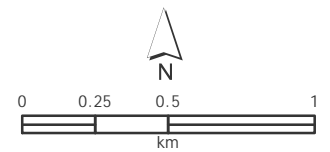


Oakdale East Estate
SSD-37486043

Figure 2-2.
IBRA subregion

Legend

-  BDAR assessment area
-  Subject land
-  IBRA subregions

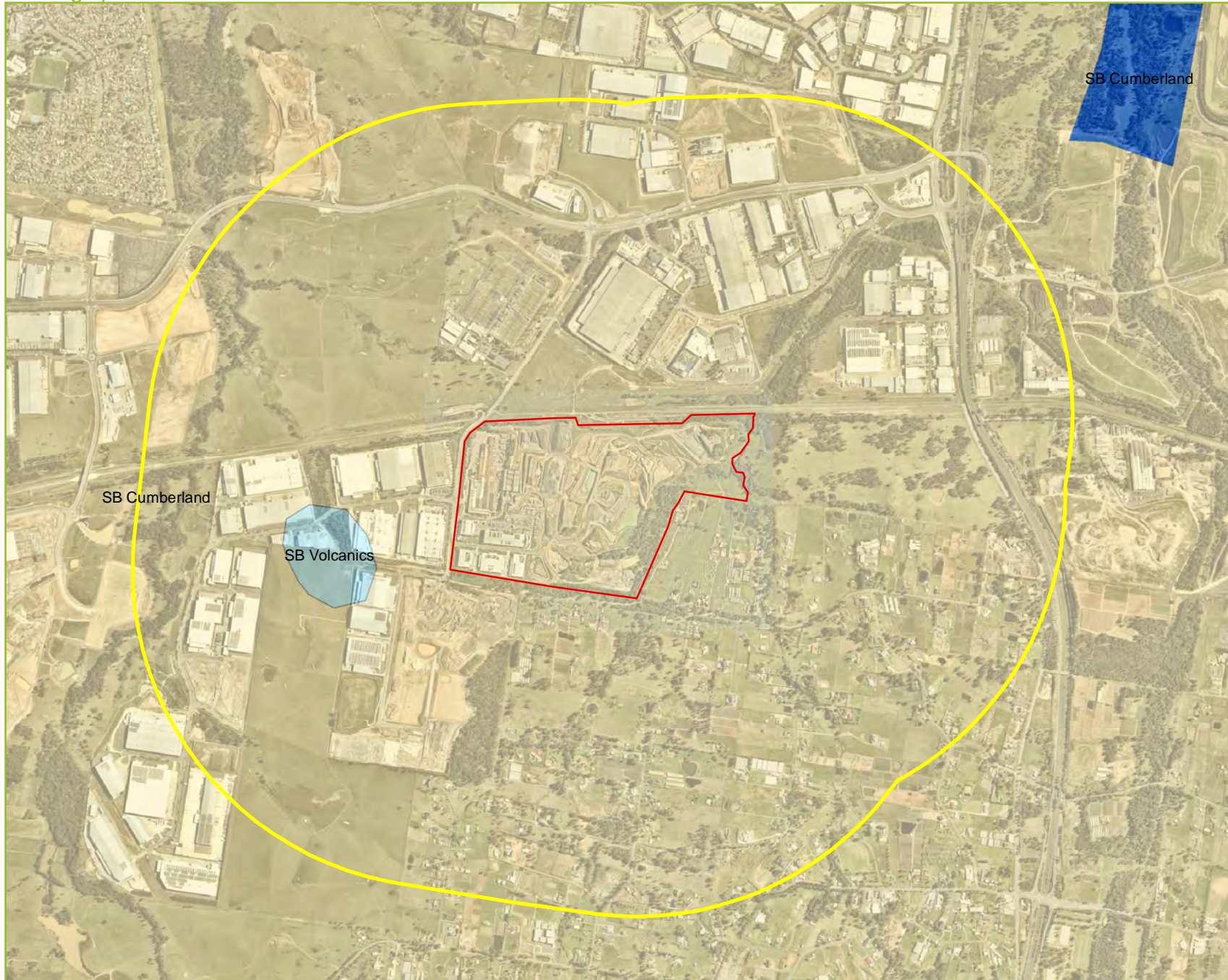


Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 17 October 2022

Data source: IBRA v7_subregions






Date prepared: 22 February 2022

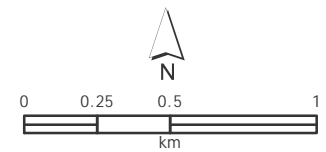


Oakdale East Estate
SSD-37486043

Figure 2-3.
Mitchell landscapes

Legend

-  BDAR assessment area
-  Subject land
- Mitchell landscapes
 -  Cumberland Plain
 -  Sydney Basin Diatremes
 -  HN Channels/Floodplains

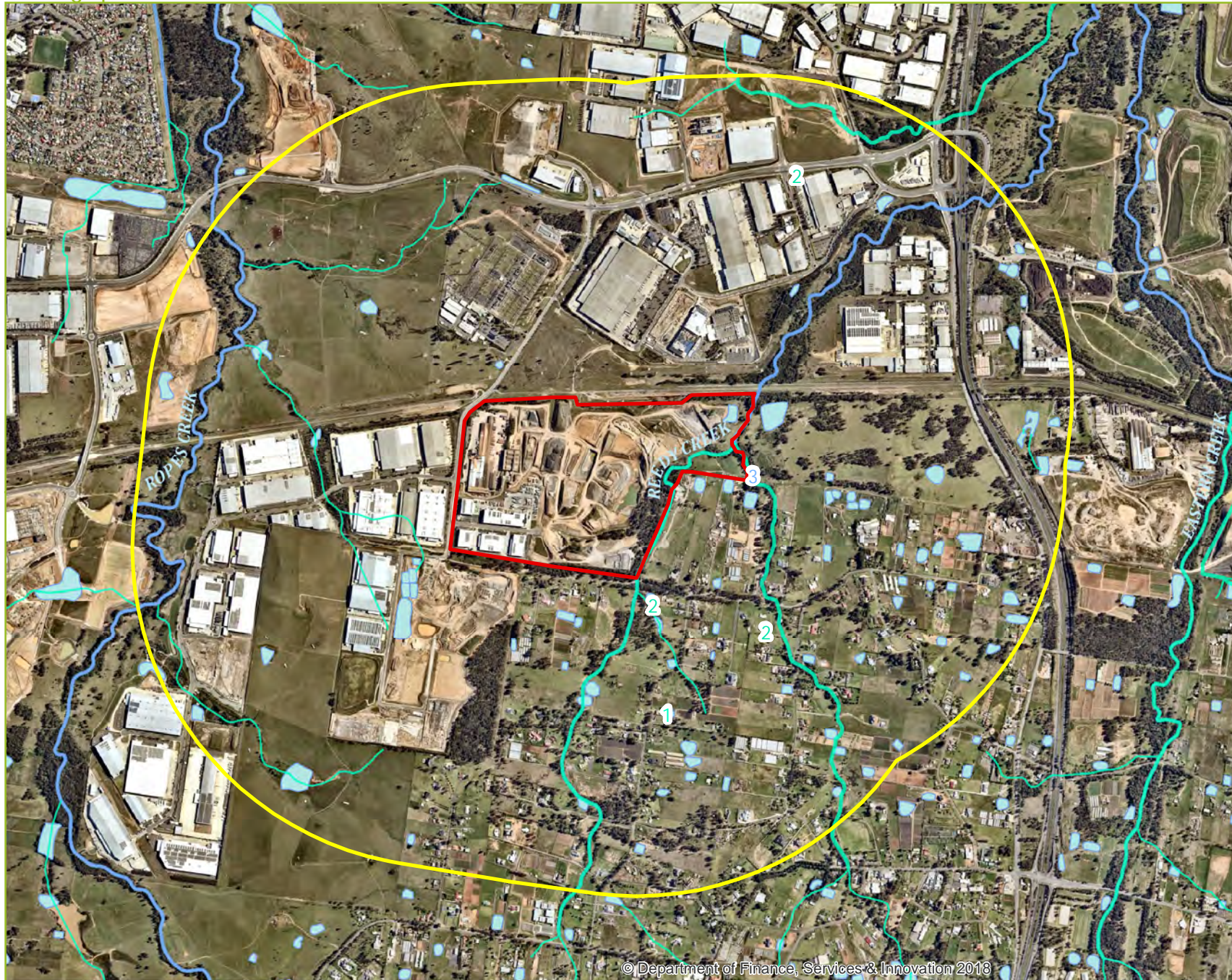


Coordinate System: MGA Zone 56 (GDA 2020)

Image source: Nearmap 17 October 2022

Data source: Mitchell_Landscapes_v3




Date prepared: 22 February 2022

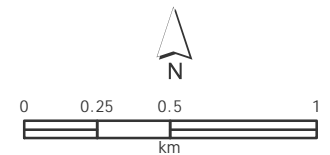


Oakdale East Estate SSSA

Figure 2-4. Watercourses

Legend

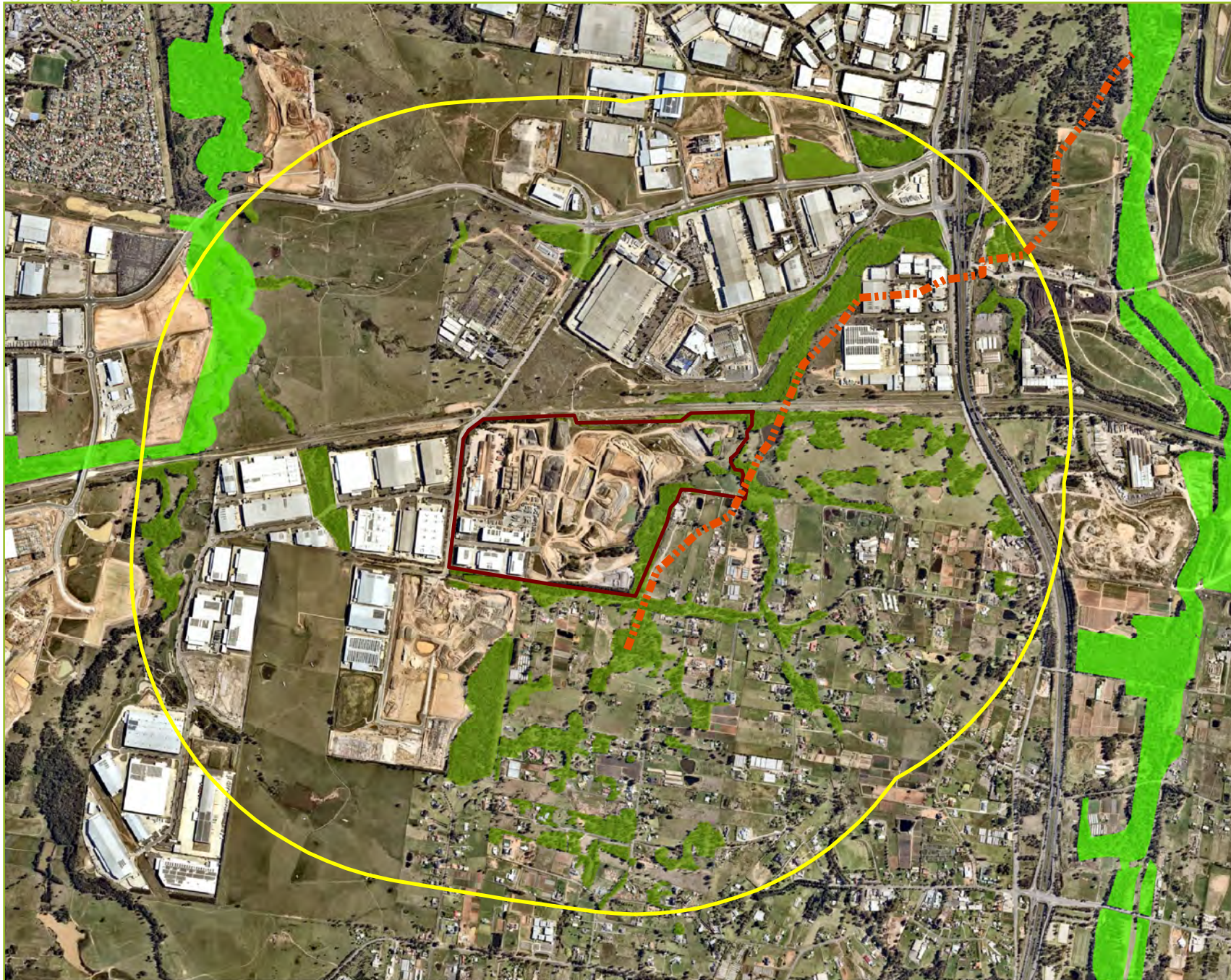
-  BDAR_assessment_area
-  Subject land
-  Stream order



Coordinate System:
MGA Zone 56 (GDA 2020)

Image source:
Nearmap 17 October 2022






Date prepared: 22 September 2022

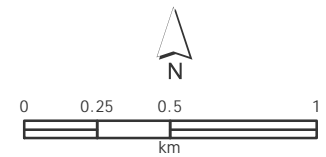


Oakdale East Estate SSSA

Figure 2-5.
Connectivity

Legend

-  BDAR_assessment_area
-  Subject land
-  Subregional corridors
-  Native vegetation
-  Local corridor



Coordinate System:
MGA Zone 56 (GDA 2020)

Image source:
Nearmap 17 October 2022

Data source:
BioMapCumberlandSubregionalCorridors




Date prepared: 22 September 2022

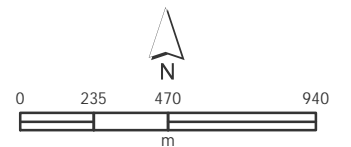


Oakdale East Estate
SSD-37486043

Figure 2-6.
Native vegetation cover

Legend

-  BDAR_assessment_area
-  Subject land
-  Native vegetation



Coordinate System:
MGA Zone 56 (GDA 2020)

Image source:
Nearmap 17 October 2021

Data source:
CumberlandPlainWest_2013_modified

Date prepared: 22 September 2022

3. Native Vegetation

3.1 Plant community types

Identification of plant community types (PCTs) within the subject land was confirmed during site surveys with reference to the BioNet Vegetation Classification database and data collected from floristic and site integrity plot/transects in accordance with Section 2 of the BAM (2020).

PCTs confidently identified with the subject land include:

1. Cumberland riverflat forest (PCT 835);
2. Cumberland shale plains woodland (PCT 849);
3. Cumberland swamp oak riparian forest (PCT 1800); and

A further PCT has been attributed to native emergent vegetation occurring within artificially constructed basins, as follows:

4. Phragmites australia and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071).

The location of floristic and site integrity plots and transects completed for this assessment are shown in Figure 3-1 and plot/transect data provided in Appendix A.

3.1.1 PCT 835: Cumberland riverflat forest

The total area of PCT 835 proposed for clearing is 0.50 ha.

PCT 835 occurs in two patches and five small groups of individual scattered trees in Precinct 5, two small areas located on an artificially modified land embankment larger patch associated with the Reedy Creek riparian corridor.

Table 3-1 summarises the areas of PCT 835 that will be cleared for SSD-37486043. All areas of PCT 835 have been assessed under the same condition state (Low-Moderate).

Table 3-1. PCT 835 in the subject land impacted by proposal

Precinct	Zone	Area (ha)	Condition state	BAM data collection
4	1	0.111	Low-Moderate - two separate patches (365m ² and 749m ²) (allowance for road construction disturbance)	1 x BAM plot/transect from area of PCT on low-moderate condition that are separated from the riparian corridor vegetation by quarrying modifications including a constructed basin embankment and recirculation channel
5	1	0.107	Low-Moderate - patch (centrally located in Precinct)	1 x BAM plot/transect located in a remnant patch east of Precinct 5, approx. 0.38ha in extent (noting that remnant patch in better condition than that to be removed and similar in condition to adjacent indirectly connected stands of this vegetation).
		0.216	Low-Moderate - patch (centrally located in Precinct)	
		0.048	Scattered small groups or individual trees, included in Low-Moderate	
		0.007	Area along boundary in northeastern corner of subject area, which allows for approximately 72 m ² . This area may incur damage for installation of a security fence required by WaterNSW to protect the Warragamba pipelines.	
Total area		0.489		

It should be noted that the required plot/transect data was collected from a larger patch of PCT 835 located outside of the subject land (see Figure 3-1), this due to the following factors:

- At the time of original BAM surveys:
 - 1,069 m² the smallest patch within the subject land was too small to adequately locate the plot/transect, without extending into man-made earthen bunds;
 - The larger patch at 2,156 m² was heavily infested with *Lycium ferocissimum* (African boxthorn) in the shrub layer;
 - All future vegetation clearing was assessed including the future freight corridor;
 - While it is now understood that this patch will not be cleared under the proposed SSDA, it best represents PCT 835 within the immediate location, in that:
 - it is more floristically diverse, and
 - does not contain the High Threat Weeds found within the impacted patches of PCT 835, thereby removing any bias that may have occurred from data collected from the larger patch within the subject land.
- The impacts of encroaching into the larger area of PCT 835 (associated with the Reedy Creek riparian corridor) was identified during the design process. This area was surveyed on identification of these impacts (May 2022), which found the following:
 - The PCT 835 vegetation occurs on artificially modified land as a result of basin construction and other earthworks associated with historical quarrying activities,
 - The BAM data initially collected is considered to conservatively represent the same condition state at this location, and
 - Adjacent areas of impact were assessed as more commensurate with PCT 1800, for which an additional PCT 1800 zone has been included in the BAM-C.

Table 3-2 summarises the criteria used for allocation of native vegetation to PCT 835, site photos are provided in photo plates 1 - 7 and the location of PCT 835 shown in Figure 3-1.

Table 3-2. Selection process for PCT 835

Criteria	Description
IBRA Region/ Subregion	Sydney Basin / Cumberland Plain
Mitchell Landscape	Cumberland Plain
Keith Formation and Class	Forested Wetlands / Coastal Floodplain Wetlands
Confirmed in vegetation mapping	OEH (2013) mapping confirmed as PCT 835
Landscape position	An open eucalypt forest situated on broad alluvial flats of the Hawkesbury and Nepean River systems, also forming narrower ribbons alongside streams and creeks that drain the Cumberland Plain.
Percent cleared values	93%
Native species present	Canopy species dominated by <i>Angophora floribunda</i> and <i>Eucalyptus tereticornis</i> with <i>Melaleuca linearifolia</i> in the mid strata and groundlayer species including includes <i>Microlaena stipoides</i> , <i>Echinopogon ovatus</i> , <i>Persicaria decipiens</i> , <i>Dichondra repens</i> , <i>Marsilea nutans</i> .
TEC	In NSW, PCT 835 is listed as the endangered ecological community (EEC) “River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions” under the BC Act. Nationally PCT 835 is commensurate with the critically endangered ecological community (CEEC) “River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria” under the EPBC Act.



Photo 1. PCT 835 plot location



Photo 2. PCT 835 plot location (on left)



Photo 3. PCT 835 in subject land



Photo 4. PCT 835 in subject land (PCT 835 plot location in background on left - behind ute)



Photo 5. PCT 835 in subject land



Photo 6. PCT 835 in subject land adjacent Precinct 4 where construction of the Precinct 4 road will require vegetation clearing.



Photo 7. PCT 835 in subject land adjacent Precinct 4 where construction of the Precinct 4 road will require vegetation clearing.

3.1.2 PCT 849 - Cumberland shale plains woodland

PCT 849 occurs as one small patch, covering 0.05 ha within the future freight corridor (see Figure 3-1). Native vegetation within this patch is located on top of a containment cell and was historically planted as an initiative by Austral Brick to improve aesthetics. Evidence of the planted origin is shown in photo plates 8 and 9.

Most of the understorey is introduced, however small and scattered occurrences of Cumberland Plain groundcovers were evident. Data from one BAM plot/transect was collected from this location, noting that this is the only area of vegetation assigned to PCT 849 that will be impacted by the proposal.

Table 3-3. Selection process for PCT 849

Criteria	Description
IBRA Region/ Subregion	Sydney Basin / Cumberland Plain
Mitchell Landscape	Cumberland Plain
Keith Formation and Class	Grassy Woodland / Coastal Valley Grassy Woodlands
Confirmed in vegetation mapping	Non-confirmed mapped areas verified during site surveys.
Landscape position	Planted and colonising native species on earthen bund
Percent cleared values	93%
TEC Status	In NSW, PCT 849 is listed as the CEEC “Cumberland Plain Woodland in the Sydney Basin Bioregion” under the BC Act. Nationally PCT 849 is commensurate with the CEEC “Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest” under the EPBC Act. The patch of PCT 849 considered in this assessment is not considered to represent a TEC due to the artificial nature of the earthen bund (on which it occurs) and the planted origin of the vegetation present.
Native species present	<i>Eucalyptus crebra</i> , <i>Corymbia maculata x citriodora</i> , <i>Glycine clandestina</i> , <i>Dichondra repens</i> .



Photo 8. PCT 849 showing planted origin

Photo 9. PCT 849 showing planted origin & weedy understorey

3.1.3 PCT 1800 - Cumberland swamp oak riparian forest

PCT 1800 occurs in two condition states within the subject land a summarised in Table 3-4. The total area of PCT 1800 proposed for clearing is 1.18 ha (0.03 ha low-moderate and 1.15 ha low condition).

Table 3-4. PCT 1800 in the subject land

Precinct	Zone	Area (ha)	Condition state	BAM data collection
4	1	0.03	Low - Moderate - area of larger patch (allowance for road construction disturbance)	1 x BAM plot/transect from an area of PCT on low-moderate condition that is separated from the riparian corridor vegetation by quarrying modifications including a constructed basin embankment
5	2	1.02	Low - poor condition, due to a lack of other native species in both shrub and ground layers. Both patches are located on excavated subsoils associated with quarrying operations and the construction of the Warragamba pipelines.	1 x BAM plot/transect from an area of approx. 1ha in extent.
SP2	1	0.13		
Total area		1.18		

Table 3-5 summarises the criteria used for allocation to PCT 1800, site photos are provided in photo plate 10 to 12 and the location of PCT 1800 within the subject land shown in Figure 3-1.

Table 3-5. Selection process for PCT 1800

Criteria	Description
IBRA Region/ Subregion	Sydney Basin / Cumberland Plain
Mitchell Landscape	Cumberland Plain
Keith Formation and Class	Forested Wetlands / Coastal Floodplain Wetlands;
Confirmed in vegetation mapping	Not mapped within subject land
Landscape position	Not assessed
Percent cleared values	60

Criteria	Description
TEC Status	Associated with Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and SE Corner Bioregions (Equivalent); and Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of NSW and SE Queensland ecological community under the EPBC Act.
Native species present	<i>Casuarina glauca</i> dominant



Photo 10. PCT 1800 Zone 1 (poor condition) - location of plot / transect data collection



Photo 11. PCT 1800 Zone 1 (low-moderate condition) - location of plot / transect data collection



Photo 12. PCT 1800 Zone 1 (low-moderate condition) - location of plot / transect data collection

3.1.4 PCT 1071 *Phragmites australia* and *Typha orientalis* wetlands

The subject land contains two artificially constructed detention basins, which are located in Precincts 4 and 5. The dominance of *Typha orientalis* (broad leaf cumbungi) is most closely matched to *Phragmites australia* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071).

A total of 0.12 ha of PCT 1071 will be cleared as follows:

1. Basin C in Precinct 4 (673 m²); and
2. Basin D in Precinct 5 (619 m²)

The BioNet community profile report for PCT 1071 identifies its habitat as included man-made water bodies, drainage lines and depressions across a wide variety of environments. Therefore, the existing dam vegetation has been assessed within the BAM-C as PCT 1071. PCT 1071 is a freshwater wetland formation, which under Section 4.3.3 of the BAM requires survey to obtain a quantitative measure of the composition and structure attributes but only the high threat weed cover functional attribute.

Quantitative measures of the composition and structure attributes were obtained from plot data used in the BAM-C for DA/347.1/2021 (as shown in photo plate 13). This data represents a better condition than that in the constructed basins assessed in this BDAR (i.e., was found to be more floristically diverse).

Aquatic vegetation is limited to *Typha orientalis* (broad-leaved cumbungi), the floating attached *Potamogeton ochreatus* (floating pond weed) and scattered occurrences of other commonly found native species such as: *Juncus usitatus* (common rush) and *Persicaria decipiens* (knotweed).

PCT 1800 within the subject land shown in Figure 3-1 and photo plate 14 shows the basin adjacent Precinct 4. Plot data is provided in Appendix A (i.e., 1 x BAM plot/transect from an area < 1ha).



Photo 13. PCT 1071 location of plot data`

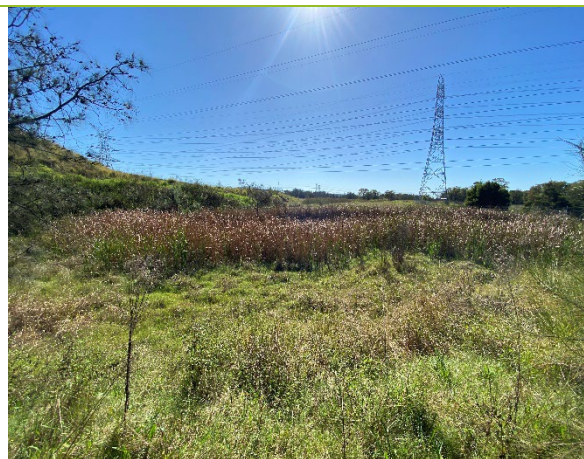


Photo 14. PCT 1071 adjacent Precinct 4

3.1.5 Landscaping

Approximately 0.43 ha of landscaping will be cleared from the subject land located with street frontage to Old Wallgrove and which surrounds the Plant 3 staff carpark.

Landscaping was undertaken as part of the Oakdale Central Estate and Old Wallgrove Road upgrade in 2015. Plantings associated with this landscaping have been assessed under the Appendix D: Streamlined assessment module of the BAM (refer Section 8).

Site photos of landscaping are shown in photo plates 15-20 and the planting schedule from civil drawings provided in Figure 3-2.



Photo 15. Car park adjacent landscaping (looking south)



Photo 16. Car park adjacent landscaping (looking north)



Photo 17. Landscaping (looking northwest)



Photo 18. Landscaping viewed from entrance to north



Photo 19. Landscaping viewed from Old Wallgrove Road



Photo 20. Landscaping viewed from Old Wallgrove Road

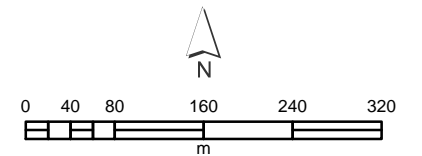
Oakdale East Estate SSD-37486043

Figure 3.1.
Subject land PCTs



Legend

- Subject_land
- Plot_locations
- Vegetation clearing
- PCT 835
- PCT 849
- PCT 1071
- PCT 1800
- Landscaping



Coordinate System: MGA Zone 56 (GDA 2020)

Image sources: Nearmap 22 September 2022

Date prepared: 24 September 2022

PLANT SCHEDULE

Symbol	Botanical Name	Common Name	Quantity	Mature	Mature	Spacing	Pot Size
			Total	Height (m.)	Spread (m.)		
Trees							
Af	<i>Angophora floribunda</i>	Rough Bark Apple	8	30m	10m	as shown	5L
Cm	<i>Corymbia maculata</i>	Spotted Gum	42	30m	8m	as shown	5L
Ec	<i>Eucalyptus crebra</i>	Narrow Leaved Ironbark	18	15m	6m	as shown	5L
Et	<i>Eucalyptus tereticornis</i>	Forest Red Gum	43	30m	8m	as shown	5L
Ms	<i>Melaleuca stypheliodes</i>	Prickly-leaved Paperbark	8	15m	8m	as shown	5L

Symbol	Botanical Name	Common Name	Quantity	Mature	Mature	Spacing	Pot Size
			Total	Height (m.)	Spread (m.)		
Street Tree Planting							
Trees							
MI	<i>Melaleuca linariifolia</i>	Snow-in-Summer	208	8m	4m	as shown	45L

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Native Shrubs and Grasses Mix							
Bs	<i>Bursaria spinosa</i>	Blackthorn	425	3m	0.5/m2	20.0%	Forestry-tube
Dv	<i>Dodonaea viscosa</i>	Hopbush	320	2.5m	0.5/m2	15.0%	Forestry-tube
Gj	<i>Grevillea junipera</i>	Juniper-leaved Grevillea	320	2m	0.5/m2	15.0%	Forestry-tube
Ar	<i>Austrodanthonia racemosa</i>	Wallaby Grass	2515	0.3m	6/m2	10.0%	Tube
Cp	<i>Capillipedium parviflorum</i>	Scented-top Grass	2515	1.5m	6/m2	10.0%	Tube
Lf	<i>Lomandra filiformis</i>	Wattle Mat-rush	2515	1m	6/m2	10.0%	Tube
Ta	<i>Themeda australis</i>	Kangaroo Grass	5030	1m	6/m2	20.0%	Tube

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Turf							
	<i>Zoysia macrantha 'Nara'</i>	Prickly Couch	33370 m2				

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Swale Planting							
	<i>Paspalum vaginatum</i>	Saltwater Couch	3720 m2				

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Low Native Grass Planting							
Dc	<i>Dianella caerulea 'Little Jess'</i>	Little Jess	6385	0.4m	6/m2		Tube
Lt	<i>Lomandra 'Tanika'</i>	Tanika	4605	0.3m	6/m2		Tube

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Bio-retention Basin No.1 Planting - Filtered Media Planting							
Ca	<i>Carex appressa</i>	Tall Sedge	160	0.8m	10/m2	20.0%	Hiko cells
Fn	<i>Ficinia nodosa</i>	Knobby Club-rush	160	1m	10/m2	20.0%	Hiko cells
Ju	<i>Juncus usitatus</i>	Common Rush	160	1m	10/m2	20.0%	Hiko cells
Dt	<i>Danthonia tenuior</i>	Wallaby Grass	80	1m	10/m2	10.0%	Hiko cells
Es	<i>Entolasia stricta</i>	Wiry Panic Grass	80	1.2m	10/m2	10.0%	Hiko cells
PI	<i>Poa labillardieri</i>	Tussock Grass	80	0.8m	10/m2	10.0%	Hiko cells
Ta	<i>Themeda australis</i>	Kangaroo Grass	80	0.8m	10/m2	10.0%	Hiko cells

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Bio-retention Basin Bank Planting - Battered Bank Planting							
DI	<i>Dianella longifolia</i>	Flax Lily	80	0.8m	10/m2	7.0%	Hiko cells
Fn	<i>Ficinia nodosa</i>	Knobby Club-rush	70	1m	10/m2	6.0%	Hiko cells
Ju	<i>Juncus usitatus</i>	Common Rush	80	1m	10/m2	7.0%	Hiko cells
Lf	<i>Lomandra filiformis</i>	Wattle Mat-rush	230	1m	10/m2	20.0%	Hiko cells
LI	<i>Lomandra longifolia</i>	Spiny-headed Mat Rush	230	1.2m	10/m2	20.0%	Hiko cells
Lm	<i>Lomandra multiflora</i>	Matrush	230	0.8m	10/m2	20.0%	Hiko cells
Ta	<i>Themeda australis</i>	Kangaroo Grass	230	0.8m	10/m2	20.0%	Hiko cells

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Bio-retention Basin No. 2 Planting - Filtered Media Planting							
Ca	<i>Carex appressa</i>	Tall Sedge	240	0.8m	10/m2	20.0%	Hiko cells
Fn	<i>Ficinia nodosa</i>	Knobby Club-rush	240	1m	10/m2	20.0%	Hiko cells
Ju	<i>Juncus usitatus</i>	Common Rush	240	1m	10/m2	20.0%	Hiko cells
Dt	<i>Danthonia tenuior</i>	Wallaby Grass	120	1m	10/m2	10.0%	Hiko cells
Es	<i>Entolasia stricta</i>	Wiry Panic Grass	120	1.2m	10/m2	10.0%	Hiko cells
PI	<i>Poa labillardieri</i>	Tussock Grass	120	0.8m	10/m2	10.0%	Hiko cells
Ta	<i>Themeda australis</i>	Kangaroo Grass	120	0.8m	10/m2	10.0%	Hiko cells

Symbol	Botanical Name	Common Name	Quantity	Mature	Density	Percentage of Mix	Pot Size
			Total	Height (m.)	(plants/m2)		
Bio-retention Basin Bank Planting - Battered Bank Planting							
DI	<i>Dianella longifolia</i>	Flax Lily	95	0.8m	10/m2	7.0%	Hiko cells
Fn	<i>Ficinia nodosa</i>	Knobby Club-rush	80	1m	10/m2	6.0%	Hiko cells
Ju	<i>Juncus usitatus</i>	Common Rush	95	1m	10/m2	7.0%	Hiko cells
Lf	<i>Lomandra filiformis</i>	Wattle Mat-rush	270	1m	10/m2	20.0%	Hiko cells
LI	<i>Lomandra longifolia</i>	Spiny-headed Mat Rush	270	1.2m	10/m2	20.0%	Hiko cells
Lm	<i>Lomandra multiflora</i>	Matrush	270	0.8m	10/m2	20.0%	Hiko cells
Ta	<i>Themeda australis</i>	Kangaroo Grass	270	0.8m	10/m2	20.0%	Hiko cells

Figure 3-2. Landscaping plant schedule

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The contractor shall check and verify all work on site (including work by others) before commencing the landscape installation. Any discrepancies are to be reported to the Project Manager or Landscape Architect prior to commencing work. Do not scale this drawing. Any required dimensions not shown shall be referred to the Landscape Architect for confirmation.

Issue	Revision Description	Drawn	Check	Date
1	ISSUE FOR CONSTRUCTION	JN	RS	02.10.15
E	ISSUE FOR SECTION 138 APPROVAL	JN	RS	29.05.15
D	ISSUE FOR SECTION 138 APPROVAL	JN	RS	31.03.15
C	AMEND TREE Mn to Ml, Em to Cm	TC	RS	12.01.15
B	FOR COUNCIL REVIEW	JN	RS	28.11.14
A	FOR TENDER	JN	RS	10.11.14

Client:



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Project:

OAKDALE CENTRAL
OLD WALLGROVE ROAD
UPGRADE

Drawing Name:

Plant Schedule

ISSUE FOR CONSTRUCTION

Job Number:

SS14-2930

Drawing Number:

LA-503

Issue:

1

3.1.6 Exotic vegetation

The remaining area within the subject land comprises non-vegetated land surfaces (haul roads, buildings, car parks). Approximately 3.0 ha of SSD-37486043's footprint was covered by exotic groundcover species at the time of site surveys.

Exotic groundcover is temporary with variable extent due to ongoing quarrying activities, approved under Plant 3's existing mining operation plan (MOP).

Approximately 11.0 ha of Precincts 2 and 4 comprised exotic groundcover species, which is being cleared under the approved DA/347.1/2021 and is not required to be reassessed in this BDAR.

Areas of exotic groundcover within the subject land is currently limited to the transmission easement and future freight corridor located between Precincts 4 and 5, which predominantly lie outside of the proposal's construction footprint.

Aerial photo plates 21 to 22 illustrates the changing nature of the landscape, which includes clearing and regrowth of exotic vegetation over the past two years.

Further, the subject land historically and until recently contained a large population of feral goats, which have grazed and trampled most areas of exotic groundcover. Feral goats have since been precluded from the site by fencing as a consent condition of DA 133.2/2019 (i.e., Stage 1, Precinct 1 of the Estate).



Photo 21. Aerial photograph (October 2020)



Photo 22. Aerial photograph (September 2022) illustrating the changing landscape within the quarry (permitted under the Plant 3 MOP). In comparison to Photo 23 it can be seen that large areas of exotic groundcover have been removed at various times (between 2020 and 2022).

3.2 Threatened ecological communities

All PCTs shown on Figure 3-3 are listed as threatened ecological communities (TECs) under the BC Act. Table 3-8 summarises whether or not each PCT has been maintained as a TEC in the BAM-C and Figure 3-4 illustrates the PCTs considered to represent TECs.

Table 3-6. TECs in the subject land

PCT / condition	BC Act listing	Maintained in BAM-C
PCT 835 / moderate	Endangered River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	YES
PCT 849 / low	Critically endangered Cumberland Plain Woodland in the Sydney Basin Bioregion	NO
PCT 1071 / low	Endangered Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	NO
PCT 1800 / moderate	Endangered Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	YES
PCT 1800 / low		NO

3.2.1 PCT 849 - Cumberland shale plains woodland

PCT 849 in the subject land comprises native local and non-local tree species that have been planted as screening on constructed bunds. The planted origin of these species is demonstrated in photo plates provided in Section 3.1.2).

3.2.2 PCT 1071 - *Phragmites australis* and *Typha orientalis* wetlands

PCT 1071 in the subject land comprises native macrophytes that have colonised artificially constructed basins. The basins are not commensurate with coastal floodplain lagoon habitat as described in the NSW Scientific Committee's determination to list the community as an endangered ecological community (EEC).

3.2.3 PCT 1800 - Cumberland swamp oak riparian forest

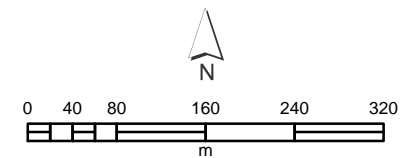
Low condition state PCT 1800 in the subject land comprises juvenile to semi-mature *Casuarina glauca* growing on spoil between the Warragamba pipelines and quarry. The location is not commensurate with habitat for the community, which includes low-lying parts of floodplains, alluvial flats, drainage lines, lake margins and fringes of estuaries; habitats where flooding is periodic and soils show some influence of saline ground water. This latter habitat feature sets it apart from other floodplain communities as described by the NSW Scientific Committee.



Oakdale East Estate SSD-37486043

Figure 3.3.
Subject land TEC clearing

- Legend
- Site_boundary
 - TECs
 - Existing native vegetation
 - PCT 835
 - PCT 849
 - PCT 1071
 - PCT 1800
 - Landscaping



Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 22 September 2022
Date prepared: 24 September 2022

3.3 Patch size

Section 4.2.3 of the BAM a determination of the patch size in hectares and assign it to one of the following classes:

- a. <5 ha, or
- b. 5-<25 ha, or
- c. 25-<100 ha, or
- d. ≥100 ha.

The patch size class is used to assess habitat suitability on the subject land for threatened species. A patch size may be assigned to more than one class to the vegetation zone if both of the following apply:

- a. a vegetation zone comprises two or more discontinuous areas of native vegetation, and
- b. the areas of discontinuous native vegetation have more than one patch size class

Most of the native vegetation within the subject land is proximal to larger patches of mapped native vegetation, which is estimated at 61.5 ha in extent as shown in Figure 3-4.

Based on this estimate, PCT 835 and PCT 1071 and PCT 1800 have been allocated to a patch class of 25-<100 ha.

PCT 849 (Zone 1) is isolated within the quarry from other larger areas of native vegetation and has been allocated to a patch class of <5 ha (see Figure 3-4).

Approximately 0.13 ha of PCT 1800 (Zone 1) is also located in isolation from other larger areas of native vegetation and has a patch class of <5 ha (see Figure 3-4). However, due to the patch class not affecting the vegetation integrity score (VIS) of PCT 1800 (Zone 1), this area has not been treated as a separate zone.

Table 3-7 summarises the patch sizes adopted in the BAM-C for each PCT.

Table 3-7. Patch classes








PCT	Zone	Patch class
835	Zone 1	25-<100 ha
849	Zone 1	<5 ha
1071	Zone 1	25-<100 ha
1800	Zone 1	25-<100 ha
1800	Zone 2	25-<100 ha

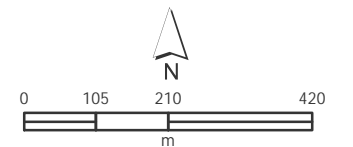


Oakdale East Estate
SSD-37486043

Figure 3-4. Patch Size

Legend

-  Subject land
-  Patch size 78.5 ha
-  Patch size 0.18 ha
-  PCT 1071
-  PCT 1800
-  PCT 835
-  PCT 849



Coordinate System:
MGA Zone 56 (GDA 2020)

Image source:
Nearmap 17 October 2021

Data source:
CumberlandPlainWest_2013_modified

Date prepared: 22 September 2022

4. Threatened species

4.1 Assessing habitat suitability for threatened species

The Threatened Biodiversity Data Collection (TBDC) identifies the threatened species that are likely to occur on or use the subject land and thereby predicts the species that require assessment. This is automatically populated in the BAM-C based on the information collected from assessing the subject land.

Threatened species are categorised in the BAM-C as ecosystem, species, or dual, credit species.

4.1.1 Ecosystem credit species

Ecosystem credit species are those threatened species where the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection.

The TBDC identifies the threatened species assessed for ecosystem credits. A targeted survey is not required to identify or confirm the presence of ecosystem credit species.

4.1.2 Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. These species are identified in the TBDC. A targeted survey or an expert report is required to confirm the presence of these species on the subject land. Alternatively, for a development, activity, clearing or biodiversity certification proposal only, the proponent may elect to assume the species is present.

4.1.3 Dual credit species

Dual credit species are threatened species that the TBDC identifies as both ecosystem credits and species credit species. Dual credit species are generally highly mobile species that rely on particular habitat components for breeding or require particular areas in the landscape important for their survival. For dual credit species, part of the habitat is assessed as a species credit. The remaining habitat components for the species are assessed as an ecosystem credit (e.g., foraging habitat).

4.2 Identify candidate species for further assessment

4.2.1 Ecosystem credit species

Table 4-1 provides a list of the ecosystem credit species derived from the BAM-C and identifies the PCTs in which each species is predicted to occur in; and the ecosystem credit type, i.e., ecosystem (foraging) indicates the species is a dual species and also considered in Section 4.2.2.

Table 4-1. Ecosystem credit species

Species Name	PCTs	Credit type
Bats		
<i>Falsistrellus tasmaniensis</i> ¹	835, 849, 1071, 1800	Ecosystem
<i>Miniopterus australis</i>	835, 849, 1071, 1800	Ecosystem (foraging)
<i>Miniopterus orianae oceanensis</i>	835, 849, 1071, 1800	Ecosystem (foraging)
<i>Micronomus norfolkensis</i>	835, 849, 1071, 1800	Ecosystem (foraging)
<i>Saccolaimus flaviventris</i>	835, 849, 1800	Ecosystem
<i>Scoteanax rueppellii</i> ¹	835, 849, 1071, 1800	Ecosystem
<i>Pteropus poliocephalus</i>	835, 849, 1800	Ecosystem (foraging)

Species Name	PCTs	Credit type
Birds		
<i>Anthochaera phrygia</i>	835, 849, 1800	Ecosystem (foraging)
<i>Artamus cyanopterus cyanopterus</i>	835, 849, 1071, 1800	Ecosystem
<i>Botaurus poiciloptilus</i>	835, 1071	Ecosystem
<i>Collocephalon fimbriatum</i>	835, 849	Ecosystem
<i>Chthonicola sagittata</i>	835, 845, 1800	Ecosystem
<i>Circus assimilis</i>	849, 1071	Ecosystem
<i>Climacteris picumnus victoriae</i>	835, 849, 1800	Ecosystem
<i>Daphoenositta chrysoptera</i>	835, 849, 1800	Ecosystem
<i>Ephippiorhynchus asiaticus</i>	1071	Ecosystem
<i>Epthianura albifrons</i>	1071	Ecosystem
<i>Glossopsitta pusilla</i>	835, 849, 1800	Ecosystem
<i>Haliaeetus leucogaster</i>	835, 849, 1071, 1800	Ecosystem (foraging)
<i>Hieraaetus morphnoides</i>	835, 849, 1071, 1800	Ecosystem (foraging)
<i>Hirundapus caudacutus</i>	835, 849, 1071, 1800	Ecosystem
<i>Iredippara gallinacea</i>	1071	Ecosystem
<i>Ixobrychus flavicollis</i>	835, 1800, 1071	Ecosystem
<i>Lathamus discolor</i>	835, 849, 1800	Ecosystem (foraging)
<i>Lophoictinia isura</i>	835, 849, 1071, 1800	Ecosystem
<i>Melanodryas cucullata cucullata</i>	835, 849, 800	Ecosystem
<i>Melithreptus gularis gularis</i>	835, 845, 1800	Ecosystem
<i>Neophema pulchella</i>	835, 845, 1800	Ecosystem
<i>Ninox connivens</i>	835, 845, 1800	Ecosystem (foraging)
<i>Ninox strenua</i>	835, 845, 1800	Ecosystem (foraging)
<i>Pandion cristatus</i>	835, 1071, 1800	Ecosystem (foraging)
<i>Petroica boodang</i>	835, 845, 1800	Ecosystem
<i>Petroica phoenicea</i>	835, 849, 1800	Ecosystem
<i>Rostralus australis</i>	1071	Ecosystem
<i>Stagonopleura guttata</i>	835, 849, 1800	Ecosystem
<i>Stictonetta naevosa</i>	1071	Ecosystem
<i>Tyto novaehollandiae</i>	835, 845, 1800	Ecosystem (foraging)
Marsupials		
<i>Dasyurus maculatus</i>	835, 849, 1071, 1800	Ecosystem
<i>Phascolarctos cinereus</i>	835, 849, 1800	Ecosystem (foraging)

Four species returned in the predicted species list were discounted from the BAM calculator (see Table 4-2)

Table 4-2. Ecosystem species discounted from the BAM-C

Species name	PCT	Justification
<i>Calidrus ferruginea</i>	1071	Migratory shore birds that favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. These habitats are absent from the subject land.
<i>Limicola falcinellus</i>		
<i>Limosa limosa</i>		
<i>Grantiella picta</i>	835, 849, 1800	A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. These habitats are absent from the subject land.

4.2.2 Species credit species

Table 4-3 provides a list of the species credit species derived from the BAM-C, and identifies the following:

- The PCTs in which each species is predicted to occur in;
- The species credit type, i.e., species (breeding) indicates the species is a dual species and also considered in Section 4.2.1;
- Whether they have been retained within the assessment (yes or no); and
- Justification for the species not retained within the assessment (i.e., following consideration of any habitat constraints, absence of habitat, geographic limitations, and habitat quality).

Table 4-3. Species credit species

Species name	PCTs	Credit type	Retained	Justification in BAM C if not retained
Amphibians				
<i>Litoria aurea</i>	1071	Species	No	Habitat degraded: i.e., the indicative habitat area available for the species is located within an operational quarry area. Subsequently, movement habitat and shelter habitat are highly disturbed. The species was the subject of targeted surveys within Precincts 2 and 4 (2018) and not detected. Nor has the species been detected within numerous studies conducting in areas surrounding the subject land.
Bats				
<i>Chalinolobus dwyeri</i>	835, 849	Species	No	Habitat constraint: i.e., no caves, crevices in cliffs, old mine workings, disused nests of the Fairy Martin (<i>Petrochelidon ariel</i>), well-timbered areas containing gullies.
<i>Miniopterus australis</i>	835, 849	Species (breeding)	No	Habitat constraint: i.e., no caves, tunnels, mines, culverts or other known structures known or suspected to be used for breeding present.
<i>Miniopterus orianae oceanensis</i>	835, 849	Species (breeding)	No	Habitat constraint: i.e., no caves, tunnels, mines, culverts or other known structures known or suspected to be used for breeding present.
<i>Myotis macropus</i>	835, 849	Species	Yes	
<i>Pteropus poliocephalus</i>	835, 849	Species (breeding)	No	Habitat constraint: i.e., breeding camps absent.
Birds				
<i>Anthochaera phrygia</i>	835, 849	Species (breeding)	No	Geographic constraint: i.e., subject land not within a mapped breeding area for the species (which is only known to breed at three locations).
<i>Burhinus grallarius</i>	835, 849	Species	No	Habitat constraint/degraded: i.e., inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber and nests on the ground in a scrape or small bare patch. Remnant vegetation impacted by the proposal is predominantly isolated and located within operational quarry areas. Vegetation impacted by the proposal that is continuous with larger remnant stands lacks suitable ground habitat, with all areas subject to predation from the European red fox.
<i>Calidrius ferruginea</i>	1071	Species	No	Geographic constraint: the subject land is not an important habitat area for the species migration.
<i>Collocephalon fimbriatum</i>	835, 849	Species (breeding)	Yes	Assumed present
<i>Haliaeetus leucogaster</i>	835, 849	Species (breeding)	No	Habitat constraint: no nests located, and no large trees present suitable for nesting by the species present.

Species name	PCTs	Credit type	Retained	Justification in BAM C if not retained
<i>Hieraaetus morphnoides</i>		Species (breeding)	No	Habitat constraint: no nests located, and no large trees present suitable for nesting by the species present.
<i>Lathamus discolor</i>	835, 849	Species (breeding)	No	Habitat constraint: i.e., site is not within mapped breeding area
<i>Limicola falcinellus</i>	1071	Species	No	Geographic constraint: the subject land is not an important habitat area for the species migration
<i>Limosa limosa</i>	1071	Species	No	Geographic constraint: the subject land is not an important habitat area for the species migration
<i>Lophoictinia isura</i>	835, 849	Species (breeding)	No	Habitat constraint: no nests located, and no large trees present suitable for nesting by the species present.
<i>Ninox connivens</i>	835, 849, 1800	Species (breeding)	No	Habitat constraint: Requires hollows of large, old trees, which are absent from the subject land
<i>Ninox strenua</i>	835, 849, 1800	Species (breeding)	No	Habitat constraint: Nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old, which are absent from the subject land.
<i>Pandion cristatus</i>	835, 849	Species (breeding)	No	Habitat constraint: i.e., no stick nests in living or dead trees or artificial structures within 100 m of a floodplain
<i>Tyto novaehollandiae</i>	835, 849, 1800	Species (breeding)	No	Habitat constraint: Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting, which are absent from the subject land
Invertebrates				
<i>Meridolum corneovirens</i>	835, 849	Species	Yes	
Marsupials				
<i>Cercartetus nanus</i>	835, 849	Species	No	Habitat absent/degraded: species has a preference for heathy habitats, which is not present. Key food source absent and the species is not recorded from within the BioNet database locality search.
<i>Petaurus norfolcensis</i>	835, 849	Species	No	Habitat degraded/absent: species requires mature or old growth woodland or forest with abundant hollows for refuge and nest sites.
<i>Phascolarctos cinereus</i>	835, 849	Species (breeding)	No	Habitat constraint: species requires large areas of habitat which are not present within the subject land, which only contains small patches of canopy trees, which are substantially isolated from larger and more intact vegetation within the locality. Species is also not recorded from within the BioNet database locality search.

Species name	PCTs	Credit type	Retained	Justification in BAM C if not retained
Flora				
<i>Acacia bynoeana</i>	849	Species	Yes	
<i>Acacia pubescens</i>	849	Species	Yes	
<i>Caladenia tessellata</i>	849	Species	No	Habitat degraded/absent: i.e., generally found in grassy sclerophyll woodland on clay loam or sandy soil. The species is also known only from old records in the Sydney area and is considered unlikely to have subsisted pre-clearing and historical quarrying operations. PCT 849 in the subject land is limited to 0.05 ha of planted vegetation located on top of a constructed containment cell and does not provide a suitable microhabitat for the species.
<i>Callistemon linearifolius</i>	835	Species	Yes	
<i>Commersonia prostrata</i>	1071	Species	Yes	
<i>Cynanchum elegans</i>	835, 849	Species	Yes	
<i>Deyeuxia appressa</i>	849	Species	No	Habitat degraded/absent: i.e., the distribution of this species overlaps with Shale/Sandstone Transition Forest, Cumberland Plain Woodlands (CPW), and Turpentine-Ironbark Forest in the Sydney Basin Bioregion. None of these communities are present within the subject land (excluding a small area of planted CPW species). <i>D. appressa</i> is a highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. The species has not been collected since and may now be extinct in the wild. PCT 849 in the subject land is limited to 0.05 ha of planted vegetation located on top of a constructed containment cell and does not provide a suitable microhabitat for the species.
<i>Dillwynia tenuifolia</i>	849	Species	No	Habitat degraded/absent: PCT 849 in the subject land is limited to 0.05 ha of planted vegetation located on top of a constructed containment cell and does not provide a suitable microhabitat for the species.
<i>Dillwynia tenuifolia</i> population	849	Species	No	Geographic limitation: the population is bounded by Western Road, Elizabeth Drive, Devonshire Road and Cross Street, Kemps Creek in the Liverpool LGA, which is outside of the subject land. PCT 849 in the subject land is limited to 0.05 ha of planted vegetation located on top of a constructed containment cell and does not provide a suitable microhabitat for the species.
<i>Eucalyptus benthamii</i>	835, 849	Species	Yes	
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	849	Species	Yes	
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	added	Species	No	Habitat absent: i.e., grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire

Species name	PCTs	Credit type	Retained	Justification in BAM C if not retained
				Park (which are absent from the subject land). In Sydney it has been recorded from Shale Sandstone Transition Forest, Sandstone Ridgetop Woodland at Wedderburn and in Cooks River / Castlereagh Ironbark Forest at Kemps Creek (which are absent from the subject land).
<i>Gyrostemon thesioides</i>	n/a	Species	No	Habitat degraded/absent: Within NSW, has only ever been recorded at three sites, to the west of Sydney, near the Colo, Georges and Nepean Rivers. Grows on hillsides and riverbanks and may be restricted to fine sandy soils. A fire-opportunist, with recruitment occurring from a soil stored seed bank following fire. The subject land has not been subject to fire since quarrying (over 50yrs).
<i>Haloragia exalata</i> subsp. <i>exalata</i>	1071	Species	Yes	
<i>Hibbertia</i> sp. Bankstown	849	Species	No	Habitat absent: i.e., currently known to occur in only one population at Bankstown Airport in Sydney's southern suburbs, in the Bankstown local government area on Castlereagh Ironbark Forest although some remnant vegetation at and near the site (along the channel in particular) suggests Castlereagh Scribbly Gum Woodland (both are absent from the subject land. Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys.
<i>Marsdenia viridiflora</i> subsp. - endangered population	849	Species	No	Habitat degraded/absent: Grows in vine thickets and open shale woodland. PCT 849 in the subject land is limited to 0.05 ha of planted vegetation located on top of a constructed containment cell and does not provide a suitable microhabitat for the species.
<i>Maundia triglochinooides</i>	835, 1071	Species	Yes	
<i>Melaleuca biconvexa</i>	835, 1071	Species	Yes	
<i>Persicaria elatior</i>	835, 1071	Species	Yes	
<i>Persoonia bargoensis</i>	849	Species	No	Habitat absent: i.e., most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, which are absent from the subject land.
<i>Persoonia hirsuta</i>	835	Species	Yes	
<i>Persoonia nutans</i>	added	Species	Yes	
<i>Pilularia novae-hollandiae</i>	835, 849	Species	Yes	
<i>Pimelea curviflora</i> var. <i>curviflora</i>	849	Species	No	Habitat absent: i.e., occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands (which are absent from the subject land). Known to occur in PCT 849, which in the subject land is limited to 0.05 ha of planted vegetation located on top of a constructed containment cell and does not provide a suitable microhabitat for the species.
<i>Pimelea spicata</i>	835, 849	Species	Yes	

Species name	PCTs	Credit type	Retained	Justification in BAM C if not retained
<i>Pomaderris brunnea</i>	835	Species	No	Geographic limitation: i.e., the species is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria.
<i>Pterostylis saxicola</i>	849	Species	No	Habitat absent: i.e., most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, which are absent from the subject land.
<i>Pultenea parviflora</i>	added	Species	No	Habitat absent: i.e., 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. Eucalyptus fibrosa is usually the dominant canopy species. <i>Eucalyptus globoidea</i> , <i>E. longifolia</i> , <i>E. parramattensis</i> , <i>E. sclerophylla</i> and <i>E. sideroxylon</i> may also be present or co-dominant, with <i>Melaleuca decora</i> frequently forming a secondary canopy layer. Such habitat is absent from the subject land.
<i>Pultenaea pedunculata</i>	849	Species	No	Habitat degraded/absent: On the Cumberland Plain the species is recorded from Cumberland Plain Woodlands, the shale-soil form of Shale Sandstone Transition Forests and Cooks River/Castlereagh Ironbark Forest. Favours sites in clay or sandy-clay soils (Blacktown Soil Landscape) on Wianamatta Shale-derived soils, usually close to patches of Tertiary Alluvium (Liverpool area) or at or near the Shale-Sandstone interface (Appin). All sites have a lateritic influence with ironstone gravel (nodules) present. PCT 849 in the subject land is limited to 0.05 ha of planted vegetation located on top of a containment cell constructed from subsoils and does not provide a suitable microhabitat for the species.
<i>Thesium australe</i>	849	Species	No	Habitat degraded/absent: Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass. PCT 849 in the subject land is limited to 0.05 ha of planted vegetation located on top of a containment cell constructed from subsoils and does not provide a suitable microhabitat for the species.
<i>Wahlenbergia multicaulis</i> - endangered population	835, 849	Species	No	Habitat absent: i.e., in Western Sydney most sites are closely aligned with the Villawood Soil Series, which is a poorly drained, yellow podsolic extensively permeated with fine, concretionary ironstone (laterite). The species is known from 13 known sites, two of which are in northern Sydney (Thornleigh and Mt Ku-Ring-Gai) with the remainder in western Sydney (Rookwood, Chullora, Bass Hill, Bankstown, Georges Hall, Campsie, South Granville and Greenacre).
<i>Zannichellia palustris</i>	1071	Species	Yes	

4.3 Targeted field surveys

4.3.1 Threatened flora species

Sixteen threatened flora species were not discounted from having a marginal potential to occur within the subject land. Table 4-4 identifies details of the surveys conducted and Table 4-5 identifies the species surveyed. Figure 4-1 illustrates the areas in which surveys were undertaken.

Table 4-4. Survey details

Date	Precinct	Weather conditions	Survey technique(s)
10.11.2020	4	Still, clear, max. 24.7°C Nil rain (166 mm in preceding month)	Most habitat areas were relatively small and able to be searched comprehensively. Waterbodies were inventoried for all species present. Survey results conducted for DA 85/2019, DA 133.2/2019, and DA 347.1/2021 have also been considered.
11.11.2020	3 & 5	Still, clear, max. 28.4°C Nil rain (166 mm in preceding month)	
25.03.2021	4 & 5	Still, clear, max. 27.5°C Nil rain (359 mm in preceding month)	
30.03.2021	4 & 5	Still, 100% overcast, 16-22.9°C Nil rain (357 mm in preceding month)	
8.04.2021	4 & 5	Light breeze, 70% overcast, 17-26.4°C 3 mm (356 mm in preceding month)	
17.02.2022	3	Still, 30% overcast max. 34.8°C Nil rain (75 mm in preceding month)	
4.05.2022	4	Still, clear 25.4°C Nil rain (90 mm in preceding month)	

Table 4-5. Targeted threatened flora species

Species name	Survey requirements	Biodiversity Risk Weighting
Flora		
<i>Acacia bynoeana</i>	All year round	High
<i>Acacia pubescens</i>	All year round	High
<i>Callistemon linearifolius</i>	Oct to Jan (surveyed in November)	Moderate
<i>Commersonia prostrata</i>	All year round	High
<i>Cynanchum elegans</i>	All year round	High
<i>Eucalyptus benthamii</i>	All year round	High
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	All year round	Moderate
<i>Haloragis exalata</i> subsp. <i>exalata</i>	All year round	Moderate
<i>Maundia triglochinooides</i>	Nov to Mar (waterbodies surveyed in November)	High
<i>Melaleuca biconvexa</i>	All year round	High
<i>Persicaria elatior</i>	Dec to May (waterbodies surveyed in November)	High
<i>Persoonia hirsuta</i>	All year round	Very high
<i>Persoonia nutans</i>	All year round	High
<i>Pilularia novae-hollandiae</i>	October to Dec	Very high
<i>Zannichellia palustris</i>	Oct to Jan (waterbodies surveyed in November)	High

4.3.2 Threatened fauna species

Threatened fauna surveys have been conducted within and external to the subject land by way of the following:

- Surveys undertaken in 2018 for the proposed Oakdale East DCP and approved Precinct 1 of the subject land;
- Surveys undertaken in 2020 as a component of a due diligence biodiversity assessment prepared to identify areas of biodiversity values in advance of designing future stages of development within the subject land;
- Targeted fauna surveys undertaken in 2020 and 2021 for the Plant 3 Rehabilitation DA; and
- Targeted fauna surveys undertaken in 2021 for the current proposal.

Methods employed during survey campaigns in 2018 are summarised in Table 4-6 and during 2020 and 2021 in Table 4-7.

Table 4-6. Threatened fauna species surveyed (2018)

Fauna group	Date	Weather conditions	Survey technique(s)	Survey effort
Diurnal birds	12/09/2018	no rain, temp 19-31°C	Diurnal opportunistic	2hr 45mins
	2/10/2018	no rain, temp 18.5-24.9°C		4hrs
	3/10/2018	no rain, temp 17.1-25.5°C		3hrs 25min
	4/10/2018	4mm rain, temp 14.4-15.1°C		2hrs
	5/11/2018	no rain, temp 18.3-28.9°C		3 hrs
Nocturnal birds	2/10/2018	no rain, temp 18.5-24.9°C	Spotlighting	3hrs 30min
	3/10/2018	no rain, temp 17.1-25.5°C		3hrs min
	4/10/2018	4mm rain, temp 14.4-15.1°C		2hrs 30min
Aboreal mammals	As above	As above	As above	As above
Terrestrial mammals	4/10/2018	4mm rain, temp 14.4-15.1°C	Hair tubes	6 days
	4/10/2018	4mm rain, temp 14.4-15.1°C	Remote camera	25 days
Bats	2/10/2018	no rain, temp 18.5-24.9°C	Spotlighting / Anabat SD-2	3hr 30min
	3/10/2018	no rain, temp 17.1-25.5°C		3hr min
	4/10/2018	4mm rain, temp 14.4-15.1°C		2hr 30min
Reptiles	2/10/2018	no rain, temp 18.5-24.9°C	Habitat search, opportunistic	1hr
	3/10/2018	no rain, temp 17.1-25.5°C		2hrs
	4/10/2018	4mm rain, temp 14.4-15.1°C		1hr
Amphibians	2/10/2018	no rain, temp 18.5-24.9°C	Call-playback (GGBF)	2hr
	3/10/2018	no rain, temp 17.1-25.5°C		1hr
	4/10/2018	4mm rain, temp 14.4-15.1°C		1hr
Molluscs	12/09/2018	no rain, temp 19-31°C	Target searches	1hr 45min
	2/10/2018	no rain, temp 18.5-24.9°C		2hrs
	3/10/2018	no rain, temp 17.1-25.5°C		2hrs
	5/11/2018	4mm rain, temp 14.4-15.1°C		2hrs

Table 4-7. Threatened fauna species surveyed (20210-2021)

Fauna group	Date	Precinct	Weather conditions	Survey technique(s)	Survey effort
Diurnal birds	10/11/2020	4	Still, clear, max. 24.7°C	20-minute dedicated surveys were conducted within each native vegetation patch and each water body	120 min
	11/11/2020	3 & 5	Still, clear, max. 28.4°C		180 min
	25/03/2021	2 & 4	Still, clear, max. 27.5°C		180 min
	30/03/2021	4 & 5	Still, 100% overcast, 16-22.9°C		220 min
	8/04/2021	5	Light breeze, 70% overcast, 17-26.4°C, 3 mm rainfall		120 min
	17/02/2022	3	Still, 30% overcast max. 34.8°C	Opportunistic listening for calls	45 min
	4/05/2022	4	Still, clear 25.4°C	Opportunistic listening for calls	180 min
Bats	25/03/2021 to 8/04/2021	2, 4 & 5	25/03/2021: Still, clear, max. 27.5°C 30/03/2021: Still, 100% overcast, 16-22.9°C 08/04/2021: Light breeze, 70% overcast, 17-26.4°C	Anabat Express™ echolocation detection as follows: <ul style="list-style-type: none"> Four locations deployed within Precincts 2 and 4 on 25/03/2021, collected on 30/03/2021 (4 units x 4 nights) Two locations deployed within Precinct 5 on 30/03/2021, collected 8/04/2021 (2 units x 10 nights) Each unit employed was placed on a tree at a height of between 3 m AGL. Being programmable, the unit was set to nocturnal only. Upon collection, each unit was noted to still be operating. Sites selected for the placement of the echolocation detector units were chosen as they corresponded to those habitats likely to be used by microchiropterans as a roosting site (i.e., proximity to hollow-bearing trees in adjacent riparian corridor) and/or during their foraging and dispersal periods (i.e., possible flyway). Any calls recorded were analysed in house using Anabat 6.3 computer software. 	36 nights
Molluscs	10/11/2020	3	Still, clear, max. 24.7°C	Dedicated ground debris searches of 20-40 person minutes within each vegetated area	220 min
	11/11/2020	5	Still, clear, max. 28.4°C		
	25/03/2021	2	Still, clear, max. 27.5°C		
	8/04/2021	5	Light breeze, 70% overcast, 17-26.4°C, 3 mm rainfall		
	4/05/2022	4	Still, clear 25.4°C		

4.3.2.1 Avifauna

No threatened bird species were detected, however an area of PCT 835 adjacent Precinct 5 was not discounted for potentially providing habitat for *Callocephalum fimbriatum* (gang-gang cockatoo). This species was not surveyed at the appropriate timeframe and has been assumed to be present.

All other bird species were surveyed within the appropriate timeframes.

4.3.2.2 Microchiroptera

Three species listed under the BC Act were recorded during the course of the field surveys.

Table 4-8. Threatened species recorded during surveys

Species/Status	Records
<i>Falsistrellus tasmaniensis</i> (eastern false pipistrelle) / Vulnerable	Confident calls recorded through use of Unit 4 (Precinct4)
	Possible calls recorded through use of Unit 6 (Precinct 5)
<i>Micronomus norfolkensis</i> (eastern coastal free-tailed bat) / Vulnerable	Confident calls recorded through use of Unit 4 (Precinct 4)
	Confident calls recorded through use of Unit 6 (Precinct 5)
<i>Miniopterus orianae oceanensis</i> (large bent-winged bat) / Vulnerable	Possible calls recorded through use of Unit 2 (Precinct 2)
	Confident calls recorded through use of Unit 4 (Precinct 4)
	Confident calls recorded through use of Unit 4 (Precinct 5)
	Confident calls recorded through use of Unit 6 (Precinct 5)

The three microchiropteran species detected are all ecosystem credit species:

1. *Falsistrellus tasmaniensi* (eastern false pipistrelle)
2. *Micronomus norfolkensis* (eastern coastal free-tailed bat)
3. *Miniopterus orianae oceanensis* (large bent-winged bat)

The eastern coastal free-tailed bat and large bent-winged bat were returned in the list of predicted species list, Whereas the eastern false pipistrelle was added to the predicted species list for inclusion as ecosystem credit species within the BAM-C.

Of the three microchiropteran species detected, only the large bent-winged bat is a dual (ecosystem and species) credit species.

The large bent-winged bat is a cave dependent species for breeding and has been discounted from the BAM-C as breeding habitat is absent from the subject site (see Table 4-3).

The location of Anabat Units, 2, 4 and 6 are shown in Figure 4-1.

4.3.2.3 *Meridolum corneovirens* - Cumberland Plain land snail

The Cumberland Plain land snail was only detected in Precinct 2 and has been assessed under the Plant 3 Rehabilitation DA.

4.3.2.4 *Litoria aurea green & golden bell frog*

The green and golden bell frog was discounted in the BAM-C based on very degraded marginal habitat present within Precinct 5 and previous surveys undertaken to determine amphibian species present conducted for BDARs prepared to support DA 133.2/2019.

Further consideration was paid to numerous targeted surveys for the species in the locality, which are summarised in Table 4-9.

Table 4-9. Green and golden bell frog surveys in the locality

Survey	Methods employed
Ecoplanning (2020) Mamre South Precinct	Commonwealth Significant impact guidelines for the vulnerable green and golden bell frog (DEWHA 2009) and the NSW ‘Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians’ (DECC 2009)
écologique (2019) Oakdale East Estate Stage 1	NSW ‘Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians’ (DECC 2009)
Ecoplanning (2019) Light Horse Interchange	NSW ‘Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians’ (DECC 2009)
Cumberland Ecology (2016a) Oakdale West Estate	NSW ‘Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians’ (DECC 2009)
Cumberland Ecology (2016b) Oakdale South Estate	NSW ‘Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians’ (DECC 2009)
Eco Logical Australia (2015) Ropes Creek Precinct	Targeted search of potential habitat
Travers Bushfire and Ecology (2014) CSR Brick Plant	NSW ‘Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians’ (DECC 2009)
Cumberland Ecology (2007) Oakdale Central Estate	NSW ‘Threatened species survey and assessment guidelines: field survey methods for fauna - amphibians’ (DECC 2009)

Despite the recent history of surveys in the locality, the species has not been detected (see Figure 4-2).

Oakdale East Estte SSSA

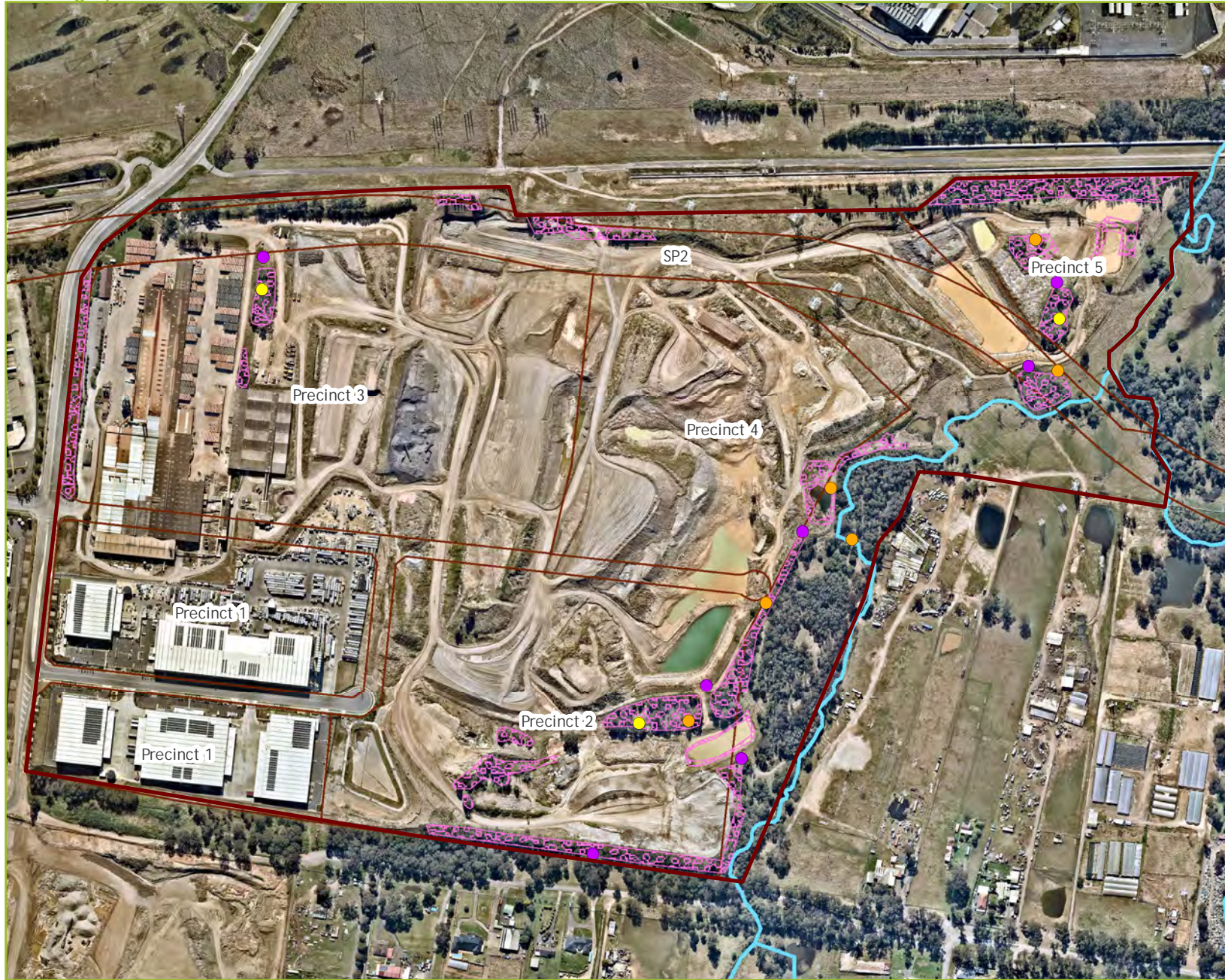
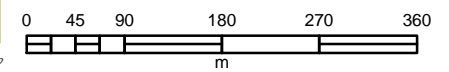
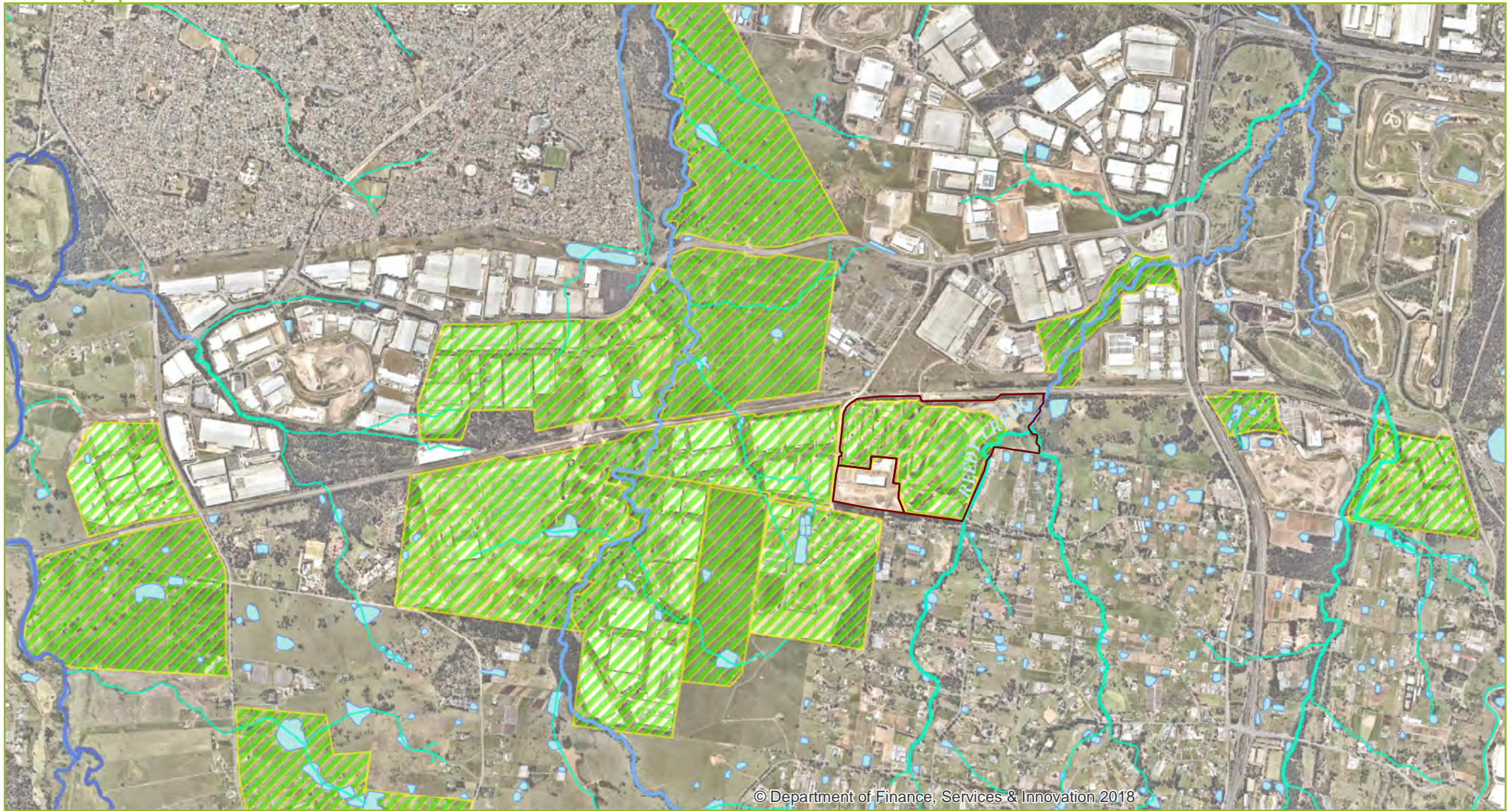


Figure 4.1. Threatened species surveys

- Legend
- Subject land
 - Fauna surveys
 - Avifauna
 - Gastropoda
 - Microchiroptera
 - Flora surveys

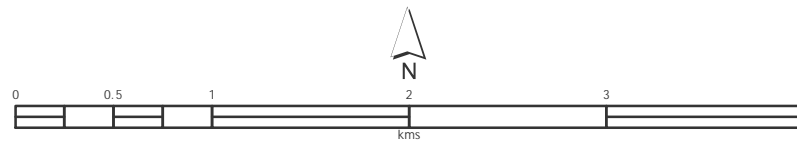


Coordinate System: MGA Zone 56 (GDA 2020) | Image sources: Nearmap 17 October 2021 | Date drawn: 22 February 2022



Legend

-  Subject land
-  GGBF surveys



Oakdale East Estate SSD-37486043

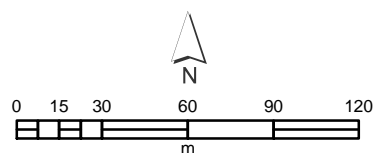
Figure 4.2. GGBF survey locations

Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 15 April 2021



Legend

- Subject land
- Precincts
- Future freight corridor
- Gang gang cockatoo
- Anabat unit 2
- Anabat unit 4
- Anabat unit 6



Oakdale East Estate SSD-37486043

Figure 4.3. Threatened fauna recorded

*Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 17 February 2022
Date prepared: 4 March 2022*

5. Matters of NES

5.1 Threatened ecological communities

In order to be protected as a MNES area the TEC must meet both key diagnostic and minimum condition thresholds as prescribed by the Australian Government (DAWE, 2020).

Three TECs listed under the EPBC Act within the subject land include the following:

- PCT 849 (Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest equivalent) does not contain a perennial understorey vegetative cover greater than 30% present - planted
- PCT 835 (Coastal floodplain eucalypt forest of eastern Australia equivalent); and
- PCT 1800 (Coastal Swamp Oak (*Casuarina glauca*) Forest of NSW and South East Queensland ecological community equivalent)

As shown in Figure 5-1, none of these PCTs meet the diagnostic threshold to be considered a MNES due to a lack of native perennial understorey species.

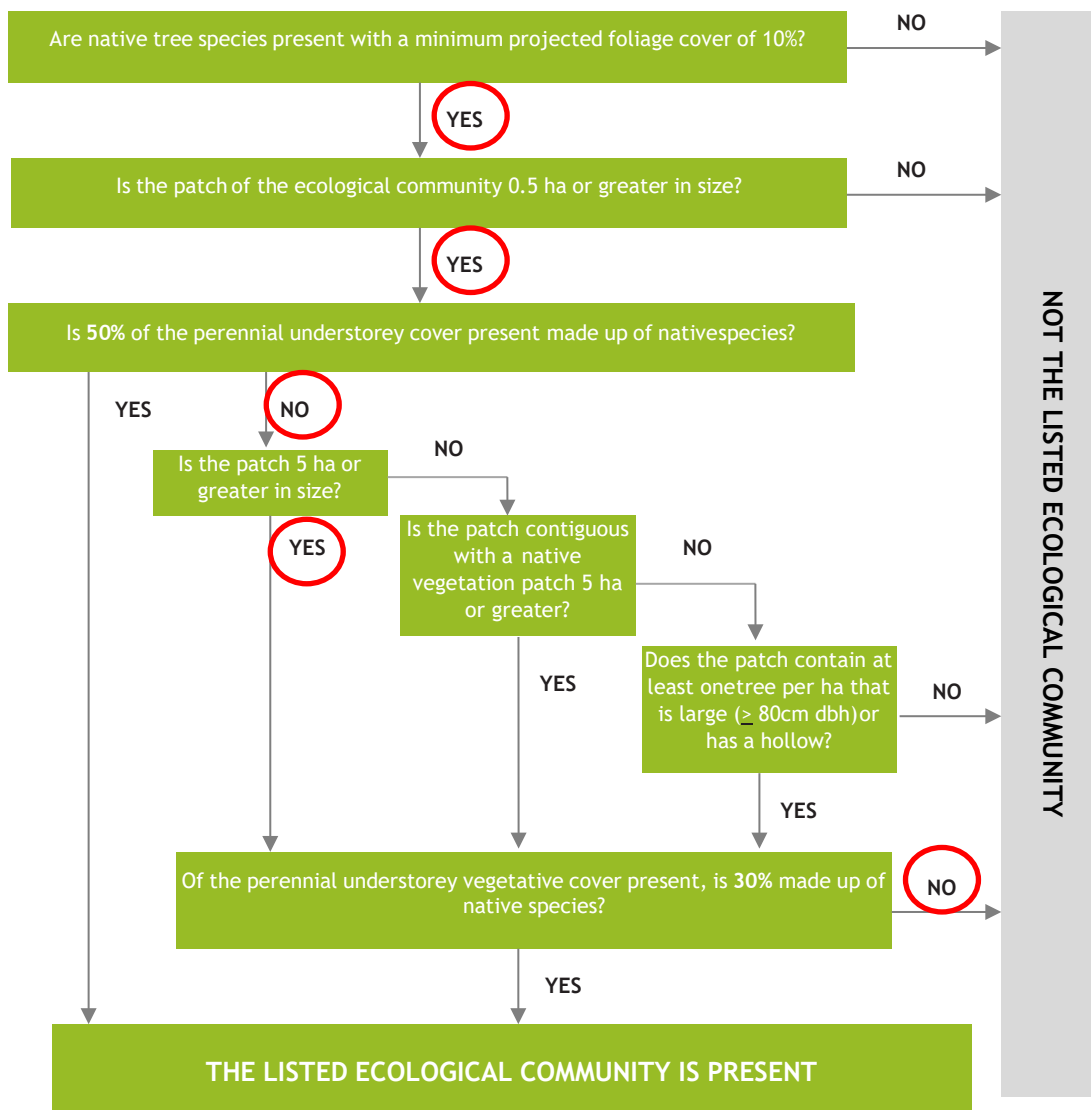


Figure 5-1. CPW diagnostic features and condition thresholds (adapted from DAWE guidelines, 2010)

5.2 Threatened species

Threatened and migratory species identified from the EPBC Act protected matters database search for the locality have been assessed for the likelihood of their occurrence within the subject land.

Table 5-1 summarises these species and whether discounted in the BAM-C, or found to be not present during surveys, or habitat important to the species is absent from the subject land.

Table 5-1. Threatened and migratory species returned from protected matters search report

Species name	Common name	Status	Justification
Flora			
<i>Acacia bynoeana</i>	Bynoes's wattle	V	Not found during surveys
<i>Acacia pubescens</i>	Downy wattle	V	Not found during surveys
<i>Allocasuarina glareicola</i>		E	Lack of suitable habitat (Castlereagh woodland on lateritic soil)
<i>Cynanchum elegans</i>	Whiteflowered wax plant		Not found during surveys
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower grevillea	V	Discounted in BAM-C
<i>Genoplesium baueri</i>	Bauer's midge orchid	E	Lack of suitable habitat (dry sclerophyll forest and moss gardens over sandstone)
<i>Haloragis exalata</i> subsp. <i>exalata</i>	Square raspwort	V	Not found during surveys
<i>Isotoma fluviatilis</i> subsp. <i>fluviatilis</i>		X	Currently known from only two adjacent sites on a single private property at Erskine Park
<i>Macadamia integrifolia</i>	Queensland nut, macadamia nut, bush nut	V	Occurs in drier types of subtropical rainforest north from Currumbin in Qld. It is not known to occur naturally in the wild in NSW
<i>Persicaria elatior</i>	Tall knotweed		Not found during surveys
<i>Persoonia hirsuta</i>	Hairy geebung	E	Not found during surveys
<i>Persoonia nutans</i>	Nodding geebung	E	Not found during surveys
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	Discounted in BAM-C
<i>Pimelea spicata</i>	Spiked rice-flower	E	Not found during surveys
<i>Pomaderris brunnea</i>	Brown pomaderris	V	Discounted in BAM-C
<i>Pterostylis gibbosa</i>	Illawarra greenhood	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). It is apparently extinct in western Sydney which is the area where it was first collected (1803)
<i>Pterostylis saxicola</i>	Sydney Plains greenhood	E	Discounted in BAM-C
<i>Pultenea parviflora</i>		V	Discounted in BAM-C
<i>Syzygium paniculatum</i>	Magenta lilly pilly	E	Grows in subtropical and littoral rainforest on sandy soils or stabilized dunes
<i>Thesium australe</i>	Austral toadflax	V	Discounted in BAM-C

Species name	Common name	Status	Justification
Amphibians			
<i>Heleioporus australiacus</i>	Giant burrowing frog	V	Lack of suitable habitat - not found on clay based soils
<i>Litoria aurea</i>	Green and golden bell frog	E	Discounted in BAM-C
<i>Litoria raniformis</i>	Growling grass frog	V	Lack of suitable habitat (permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps)
Aves			
<i>Actitis hypoleucos</i>	Common sandpiper	Mig	The subject land does not occur within areas mapped by the BAM as Migratory Shorebird Important Areas.
<i>Apus pacificus</i>	Fork-tailed swift	Mig	Not observed during surveys
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	Mig	The subject land does not occur within areas mapped by the BAM as Migratory Shorebird Important Areas.
<i>Calidris ferruginea</i>	Curlew sandpiper	CE, Mig	The subject land does not occur within areas mapped by the BAM as Migratory Shorebird Important Areas.
<i>Anthochaera phrygia</i>	Regent honeyeater	CE	The subject land does not occur within areas mapped by the BAM as important to the species
<i>Botaurus poiciloptilus</i>	Australasian bittern	E	Not observed during surveys
<i>Dasyornis brachypterus</i>	Eastern bristlebird	E	Habitat absent (low vegetation including heath and open woodland with a heathy understorey)
<i>Gallinago hardwickii</i>	Latham's snipe	Mig	Habitat absent (open, freshwater wetlands that have some form of shelter, usually low and dense vegetation nearby)
<i>Grantiella picta</i>	Painted honeyeater	V	Discounted in BAM-C
<i>Haliaeetus leucogaster</i>	White bellied sea-eagle	Mig	Discounted in BAM-C
<i>Hirundapus caudacutus</i>	White throated needletail	Mig	Almost exclusively aerial species that mostly forage in areas of updraughts, such as ridges, cliffs or sand-dunes
<i>Lathamus discolor</i>	Swift parrot	Mig	Discounted in BAM-C, maintained as an ecosystem credit species
<i>Monarcha melanopsis</i>	Black-faced monarch	Mig	Habitat absent (rainforest ecosystems)
<i>Motacilla flava</i>	Yellow wagtail	Mig	Habitat absent - open grassy flats near water, include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves
<i>Myiagra cyanoleuca</i>	Satin flycatcher	Mig	Habitat absent - common in tall wet sclerophyll forest, often in gullies or along

Species name	Common name	Status	Justification
			water courses. In woodlands they prefer open, grassy woodland.
<i>Numenius madagascariensis</i>	Eastern curlew	CE, Mig	The subject land does not occur within areas mapped by the BAM as Migratory Shorebird Important Areas.
<i>Rostratula australis</i>	Australian painted snipe	E	Habitat important to the species not present, maintained as an ecosystem credit species
<i>Rhipidura rufifrons</i>	Rufous fantail	Mig	Not observed during surveys
<i>Tringa nebularia</i>	Common greenshank	Mig	The subject land does not occur within areas mapped by the BAM as Migratory Shorebird Important Areas.
Insects			
<i>Synemon plana</i>	Golden sun moth	CE	Lack of suitable habitat (Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses <i>Austrodanthonia</i> spp.)
Mammals			
<i>Chalinolobus dwyeri</i>	Large-eared pied bat	V	Discounted in BAM-C
<i>Dasyurus maculatus</i>	Spotted-tailed quoll	E	Discounted in BAM-C
<i>Petauroides volans</i>	Greater glider	V	Lack of suitable habitat, typically found in highest abundance in taller, montane, moist eucalypt forests on fertile soils, with relatively old trees and abundant hollows
<i>Petrogale penicillata</i>	Brush-tailed rock wallaby	V	Lack of suitable habitat, occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges,
<i>Phascolarctos cinereus</i>	Koala	V	Discounted in BAM-C
<i>Pseudomys novaehollandiae</i>	New Holland mouse	V	Lack of suitable habitat (open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes)
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	V	Potential foraging habitat, but not important to the species

5.3 EPBC Act referral process

A person must not take an action that has, will have or is likely to have a significant impact on any of the MNES without approval from the Australian Government Minister for the Environment (the Minister).

Section 5.1 has concluded that the vegetation communities in the subject land do not meet the criteria for consideration as a MNES and Section 5.2 has indicated that the subject land is unlikely to provide habitat important to any threatened or migratory species.

6. Prescribed Impact Identification

Prescribed additional biodiversity impacts (prescribed impacts) must be assessed as part of the BOS, as per clause 6.1 of the BC Regulation. Prescribed impacts include those impacts on the habitat of threatened species or ecological communities from development that is not directly caused as a result of vegetation clearing.

Table 6-1 lists the prescribed impacts, which are identified in Clause 6.1 of the *Biodiversity Conservation Regulation 2017* and the relevance of each prescribed impact in relation to the proposal.

Table 6-1. Prescribed and Uncertain Impacts

Will there be impacts on any of the following	Yes/No	If yes, address the assessment questions from section 9.2.1 of the BAM
(a) Development on the habitat of threatened species or ecological communities associated with: <ul style="list-style-type: none"> i. karst, caves, crevices, cliffs, rock outcrops and other geological features of significance; ii. human-made structures; iii. non-native vegetation; 	NO	<ul style="list-style-type: none"> i. no karst, caves, crevices, cliffs and other features of geological significance occur on or near the subject land. ii. no human-made structures would be disturbed as a result of the proposal. iii. non-native vegetation within the subject land is unlikely to provide habitat for threatened species or ecological communities.
(b) on areas connecting threatened species habitat, such as movement corridors	NO	The subject land is not mapped within any connecting threatened species habitat of movement corridors.
(c) that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)	NO	The proposal will not result in impacts to water quality, water bodies and hydrological processes that sustain threatened entities. Refer Section 6.1 below for further discussion.
(d) on threatened and protected animals from turbine strikes from a wind farm	NO	No wind turbines are proposed
(e) on threatened species or fauna that are part of a TEC from vehicle strikes	NO	The proposal is not anticipated to impact on any threatened or other fauna as a result of vehicle strikes.

6.1 Water quality, water bodies and hydrological processes

6.1.1 Water quality

Potential short term construction impacts are typically associated with earthworks and other activities that result in erosion and transport of sediments into native bushland and waterways. An Erosion, Sediment and Control Plan (ESCP) has been prepared as a requirement of the SEARs, which details the proposed construction mitigation measures to prevent impacts to receiving waters.

On-site detention (OSD) capture of stormwater runoff associated with the SSD-37486043 is required to be compliant with both DPE and Council's requirements (during construction) and bioretention basins (during the operational phase). Both are required to meet pre-development stormwater quality conditions.

Monitoring and auditing of the implementation / maintenance of the ESCP and OSDs will be undertaken as prescribed in the CEMP.

Consequently, the potential for impacts resulting for poor water quality discharge into Reedy Creek is considered to a low risk.

6.1.2 Hydrological processes

The subject land has been operated as a quarry for over 50 years, in which time the surface hydrology has been managed through a network of detention basins, stormwater drainage channels, and recirculation of captured runoff (i.e., preventing base flow discharge into Reedy Creek, other than surface flows from neighbouring land and the riparian bushland).

Douglas Partners Pty Ltd (2021) undertook a geotechnical assessment of the subject land, which found that aquifer recharge is minimal due to the low permeability of the near surface clays and horizontal flow velocities in the soil and rock. Assessment of historical imagery generally indicated little to no evidence of significant water seepage through the quarry walls or floor.

These results are similar to that found during hydrogeological investigations for the Camden Gas Project area (AGL, 2013), which indicated very limited rainfall recharge to the Wianamatta Group Shales (over which the subject land lies).

The Wianamatta Group Shales are considered aquitards, which typically comprise compacted layers of clay, silt or rock that retard water flow underground; that is, they act as a barrier for groundwater and separate aquifers and partially disconnect the flow of water underground (AGL, 2013).

The existing riparian and adjacent vegetation do not comprise obligate groundwater dependant ecosystems (GDEs) as follows:

- Obligate GDEs are wetland systems that are not present within the subject land;
- Cumberland Plain woodland and riparian vegetation are indicative of "highly probable" GDEs (Serov et al., 2012) and considered terrestrial GDEs;
- Terrestrial GDEs appear to be dependent on very shallow, localised perched groundwater in soils (derived from Wianamatta Shale) and local colluvium/alluvium rather than the deeper, regional groundwater systems.

The potential for the proposal to impact on hydrological processes (that threatened ecological communities and/or species are reliant on) is considered a low risk, due to the following:

- The absence of threatened species reliant on surface hydrology and/or groundwater processes within the subject site;
- The terrestrial GDEs, located near and within the Reedy Creek riparian corridor, being more likely reliant on the local colluvium/alluvium landscape and not deeper groundwater systems recharge;
- The proposed cut and fill, retaining walls and Estate road construction being unlikely to have a significant impact on hydrological processes above that which has historically existed; and
- The proposal's design required to achieve the flow objectives of the Fairfield DCP, which considers pre-development flows.

7. Avoid or Minimise Impacts

7.1 Avoiding or minimising impacts on biodiversity values

7.1.1 Avoiding or minimising impacts

In accordance with Section 7.1.2 of the BAM, the proposal is, as far as practical, located as follows:

- In areas that have no biodiversity values; and
- In vegetated areas that:
 - are in the poorest condition, and/or
 - do not contain habitat for threatened species.

The Estate is within the site of the former quarry, which is subject to rehabilitation under the approved DA 347.1/2021. Most of the proposed clearing is located on land zoned IN1 (industrial), which includes the following:

- Growth of *Casuarina glauca* (assigned to PCT 1800), which has colonised spoil from the construction of the Warragamba pipeline along the northern boundary of the subject site. This vegetation returned a low VIS score of 10.8;
- An area of planted native vegetation located on top of a containment cell (assigned to PCT 849). This vegetation returned a low VIS score of 14.5;
- Native macrophytes that have colonised manmade basins (assigned to PCT 1071; and
- Two patches of native vegetation (assigned to PCT 835), which are isolated within the active quarry by deep excavations and contain dense weed infestations.

Less than 0.1 ha (983m²) of vegetation clearing will occur on land zoned as C2 (conservation), which comprises the following:

- 0.03 ha (328m²) of PCT 1800, which is growing on B horizon spoil mounds from past basin construction;
- 0.04 ha (365m²) of PCT 835, which is growing on B horizon spoil mounds (as above); and
- 0.03 ha (300m²) of PCT 1071, which comprises native macrophytes that has colonised a manmade basin that is partially located on C2 zoned land (but largely occurs on IN1 zoned land).

The disturbance to C2 zoned land is required for the construction of a Precinct 4 road that terminates at the northeastern corner of Precinct 4 (noting that this activity is permissible in this zone). The residual footprint of the road lies outside of C2 zoned land and the disturbed encroachment into C2 zoned land will not be permanent. Post-construction this area will be remediated, revegetated, and maintained in perpetuity, which is an action/activity identified in Section 7.1.2 of the BAM¹.

Over six ha of native vegetation is being conserved along the eastern boundary of Precincts 2, 4 and 5, which includes a large proportion of land zoned IN1. Thereby averting future potential loss of 2.7 ha of native vegetation (0.9 ha under this proposal and 1.8 ha under the approved DA 347.1/2021).

The conservation of these areas are detailed in both the DA 347.1/2021 approved Vegetation Management Plan (VMP) and the VMP prepared for this proposal (provided in Appendix C).

7.1.2 Direct impacts

The proposal will unavoidably impact on approximately 2.28 ha of native vegetation that comprises:

¹ Section 7.1.2 (e). actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.

- 0.65 ha of native vegetation that will be offset under the Scheme;
- 1.2 ha of native vegetation that has low vegetation integrity scores and does not require offsetting under the Scheme; and
- 0.43 ha of landscaping (which has been assessed under the BAM planted native vegetation module) and also does not require offsetting under the Scheme.

One area of PCT 835 (0.49 ha) was not surveyed at the appropriate time for the threatened *Callocephalon fimbriatum* (Gang-gang Cockatoo). While this patch of PCT 835 is considered unlikely to provide habitat of importance to this species, in the absence of compliant survey an assumption of presence has been adopted (refer Section 8).

7.1.3 Indirect impacts

The proposal will ensure any indirect impacts are avoided, minimised and mitigated through the implementation of best management practices (refer Table 8-4). These measures will be detailed within the proposal's Construction and Environmental Management Plan (CEMP) and supporting sub-plans, including the following:

- Erosion and Sediment Control Plan (ESCP);
- Flora and Fauna Management Plan (FFMP), which will document pre-clearance and clearance processes to achieve the following, but not limited to, objectives:
 - protection of retained native vegetation and habitat
 - prevention of injury/mortality to all fauna
 - prevention of the spread and/or introduction of weeds and pathogens
- Vegetation Management Plan (VMP - refer Appendix C); and
- Biosecurity Management Plan (BMP - refer Appendix D)

Refer Section 9 for further detail on the avoidance, minimisation and mitigation measures.

7.2 Avoiding and minimising prescribed impacts

Prescribed impacts are processes that have the potential to indirectly impact threatened ecological communities and/or species that are reliant on caves, rocky outcrops, flyways, surface hydrology and groundwater processes.

The subject land does not contain caves, rocky outcrops or flyways and as discussed in Section 6.1.2.

As discussed in Section 6.1.2, the proposal will not result in any impacts to surface hydrology and groundwater processes, above that which currently exists.

8. Assessing the impacts of the proposal on biodiversity values

8.1 Direct impacts

8.1.1 Native vegetation and habitat

The proposal will directly impact on approximately 2.28 ha of native vegetation (commensurate with three PCTs and attributed to a fourth PCT) and landscaping as summarised in Table 8-1.

Table 8-1. Native vegetation clearing

PCT	Condition	Area (ha)
Cumberland river-flat forest (PCT 835)	Low-Moderate	0.49
Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion planted (PCT 849)	Low-planted	0.05
Phragmites australia and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion (PCT 1071)	Low	0.13
Cumberland Swamp Oak riparian forest (PCT 1800)	Low	1.15
Cumberland Swamp Oak riparian forest (PCT 1800)	Low-Moderate	0.03
Landscaping	Low	0.43
Total all native vegetation		2.28

8.1.2. Change in Vegetation Integrity Score

Table 8-2 provides a summary of the changes in vegetation integrity scores for each PCT management zone, as calculated in the BAM-C.

Table 8-2. Change in vegetation integrity scores

PCT ID	Zone	PCT zone name	Vegetation integrity scores			
			Composition	Structure	Function	Current
835	1	835_ Low-Moderate	40.7	26.5	62.5	40.8
849	1	849_Low-planted	6.2	32	15.3	14.5
1071	1	1071_Low	20	86	-	41.4
1800	1	1800_Low	2.5	17.4	28.9	10.8
1800	2	1800_ Low-Moderate	26.9	38.5	54.1	38.3

8.1.3. Landscaping

The area of landscaping along Old Wallgrove Road frontage has been assessed under Appendix D: Streamlined assessment module -Planted native vegetation of the BAM.

Appendix D provides a decision-making for the assessment of planted native vegetation using the BAM. Where only part of the subject land contains planted native vegetation, this module may be used to assess that part of the development.

Evidence demonstrating the application of the decision-making key to the areas of planted native vegetation is provided in Section 3.1.5 and Table 8-3.

Table 8-3. D.1 Decision-making key

Key	If yes	If no
<p>1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?</p>	<p>The planted native vegetation must be allocated to the best fit PCT, and the BAM must be applied.</p>	<p>No, the area does not occur in a mosaic with remnant native vegetation Go to 2.</p>
<p>2. Is the planted native vegetation:</p> <p>a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and</p> <p>b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?</p>	<p>The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.</p>	<p>No, it was not planted for these purposes Go to 3.</p>
<p>3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:</p> <p>a. a species recovery project</p> <p>b. Saving our Species project</p> <p>c. other types of government funded restoration project</p> <p>d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat</p> <p>e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g., Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)</p> <p>f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or</p> <p>g. approved vegetation management plan (e.g., as required as part of a Controlled Activity Approval for works on waterfront land under the <i>NSW Water Management Act 2000</i>)?</p>	<p>The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.</p>	<p>No, it was not planted for the purpose of providing threatened species habitat Go to 4.</p>
<p>4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?</p>	<p>Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).</p>	<p>No Go to 5.</p>
<p>5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in</p>	<p>Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of</p>	

Key	If yes	If no
agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or tea tree farms?	Chapters 4 and 5 of the BAM are not required to be applied.	

D.2 Assessment of planted native vegetation for threatened species habitat

D.2 (assessment of planted native vegetation for threatened species habitat) requires an assessment of the suitability of the planted native vegetation for use by threatened species. Incidental sightings or evidence (e.g., scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation is to be recorded.

If there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species. Species credits are not required to offset the proposed impacts.

The steps taken to assess threatened species habitat and all reasonable measures proposed to be taken to mitigate or minimise impacts must be set out in the BDAR.

This assessment has concluded that the planted native vegetation does not provide habitat for threatened species, due to the following:

- Previous clearing of this location to facilitate the upgrade of Old Wallgrove Road in association with Oakdale Central Estate development in 2015;
- Evidence of the planted origin of species as shown in Figure 3-2;
- The relative immaturity of the planted native vegetation, i.e., approximately 7 years;
- The absence of habitat features that would support any threatened species; and
- The location of the vegetation, which is juxtaposed between the hardstand areas (i.e., Plant 3’s operational area, staff car park, buildings and Old Wallgrove Road).

8.2 Indirect impacts

Indirect impacts are generally those that affect areas outside of the development footprint but occur due to the development, and which impact on native vegetation, threatened ecological communities, threatened species and their habitat. The BAM requires that the following aspects be assessed:

- a. the nature, extent, frequency, duration and timing of indirect impacts of the proposal, inclusive of the following:
 - i. during construction
 - ii. during operation
 - iii. arising from a change in land-use patterns
- b. the consequences of indirect impacts on biodiversity values;
- c. any limitations to data, assumptions and predictions about impacts on biodiversity; and
- d. reduced viability of adjacent habitat due to noise, dust or light spill.

Table 8-3 provides a summary of indirect impacts identified in the BAM that must be considered:

Table 8-4. Assessment of indirect impacts

Indirect impact	Duration	Biodiversity values impacted	Consequence
Inadvertent impacts on adjacent habitat or vegetation, such as:			
<ul style="list-style-type: none"> Increased sedimentation 	Short term during construction	General environment	<p>Vegetation clearing and earthworks can expose soils and subsoils, which following rainfall may erode and mobilise soils in runoff, potentially smothering ground layer vegetation (in turn affecting health through a decrease in photosynthesis) or impact on water quality in downstream aquatic ecosystems (in turn affecting aquatic organisms that may provide a food resource for native fauna).</p> <p>Providing that best practices in erosion and sedimentation management are implemented in accordance with the project’s Erosion and Sediment Control Plan (ESCP) the consequence of this impact is considered to be a low risk.</p>
<ul style="list-style-type: none"> Introduction of weeds and pathogens 	Short term during construction	General environment	<p>Construction activities have the potential to both spread existing weed infestations, introduce new weed species, and introduce or spread soil borne pathogens on machinery and equipment. As a consequence, the condition (e.g., site integrity values) of retained and neighbouring vegetation could be decreased.</p> <p>Providing that the mitigation measures identified in Appendices C and D are implemented the consequence of this impact is considered to be a low risk.</p>
<ul style="list-style-type: none"> Trampling or other damage to remnant vegetation, including threatened species 	Short term during construction	N/A	<p>No remnant vegetation, including threatened species would be at risk of trampling or other damage. Retained native vegetation is isolated from the development by Estate roads and protected by fencing.</p> <p>Allowance for construction impacts outside of the design footprint have been included in the total area of clearing being offset under the Scheme.</p>
<ul style="list-style-type: none"> Fertiliser drift 	N/A	N/A	Fertiliser will not be used
<ul style="list-style-type: none"> Rubbish dumping, wood collection, removal and disturbance of rocks, including bush rock 	N/A	N/A	The subject lands will not be accessible by the public (through security fencing) and the consequence of this impact is considered to be a low risk.

Indirect impact	Duration	Biodiversity values impacted	Consequence
Reduced viability of adjacent habitat due to:			
Dust	Short term during construction	Reedy Creek riparian corridor (PCTs 1800 and 835)	<p>Dust generation during construction activities will be managed through the following measures:</p> <ul style="list-style-type: none"> • Construction staging, • Minimising material stockpiles, • Cleaning (water suppression) of construction haul roads, • Speed restrictions, and • Implementation of the project’s ESCP, and • Implementation of mitigations measures prescribed within the Construction Environmental Management Plan (CEMP). <p>The proposal is considered unlikely to reduce viability of any native vegetation or habitat within the locality due to dust generation.</p>
Light spill	Long term during operation	Reedy Creek riparian corridor (PCTs 1800 and 835)	<p>SSD-37486043 seeks approval for 24hour operation of industrial lots. Therefore, the operational phase of the development has the potential to impact on adjacent bushland and fauna habitat.</p> <p>Lighting required for the Estate’s roads and industrial lots where proximal to retained native vegetation will be designed in accordance with available standards and guidelines for mitigating impacts on fauna habitat, which include but may not be limited to the following:</p> <ul style="list-style-type: none"> • Commonwealth of Australia (2020) National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds; and • AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting recognises the impact of artificial light on biota. T <p>The above guidelines provide a range of measures to minimise light spill impacts on fauna and fauna habitat. Examples include:</p> <ul style="list-style-type: none"> • The use of recent advances in smart control technology options for better controlled and targeted artificial light management; • Ensuring that lighting is shielded and directed only to the intended object or area;

Indirect impact	Duration	Biodiversity values impacted	Consequence
			<ul style="list-style-type: none"> • Ensuring that light intensity is appropriate for the target area using only the minimum number and intensity of lights needed to provide safe and secure illumination for the area at the time required to meet the lighting objectives; and • Consideration of the following lighting aspects: <ul style="list-style-type: none"> ○ high quality, low glare lighting, which enhances visibility for the user at night, reduces eye fatigue, improves night vision and delivers light where it is needed, ○ non-reflective, dark coloured surfaces, ○ reduced or filtered out blue, violet and ultraviolet wavelengths, which wildlife are sensitive to. <p>Providing the design of the Estate’s lighting installations incorporates the above and current best practice measures, the likelihood of light spill impacts on fauna and fauna habitat will be minimised as far as practical.</p>
Noise	Short term during construction Long term during operation	Reedy Creek riparian corridor (PCTs 1800 and 835)	<p>Short term construction noise is unlikely to be substantially different to noise emanating from quarrying operations that have presided over the site for several decades.</p> <p>Long term operational noise (in particular, that from potential 24-hour operations), has the potential to impact on habitat for resident fauna.</p> <p>Based on assessment findings, there is unlikely to be a significant impact on threatened species and/or habitat for threatened species. This is due to:</p> <ul style="list-style-type: none"> • The proximity of the site to Old Wallgrove Road and existing operations with adjacent industrial areas; • A lack of optimal habitat for threatened species, and the degraded condition of native vegetation to be retained. The latter associated with the riparian corridor of Reedy Creek, which is subject to grazing by domestic and feral fauna from adjacent land use (noting that Reedy Creek meanders in and out of the subject land and cannot be fully protected from such as not within the Applicant’s control).

Indirect impact	Duration	Biodiversity values impacted	Consequence
Increased risk of starvation, exposure, loss of shade or shelter	N/A	N/A	The proposal would not result in any significant changes to existing food resources, shade or shelter. Native vegetation clearing will impact highly degraded and isolated small patches, which do not provide optimal shade and shelter for fauna.
Loss of breeding habitat	N/A	N/A	Breeding habitat for threatened species is absent from subject land
Habitat connectivity			
Habitat connectivity	N/A	N/A	The subject land does not contain any regional corridors. Existing habitat connectivity provided by the Reedy Creek riparian corridor will be maintained and improved upon through the implementation of vegetation management plans for Precincts 2, 4 and 5.
Water bodies, water quality and hydrological processes			
Water bodies, water quality and hydrological processes	Short and long term	Reedy Creek riparian corridor (PCTs 1800 and 835)	Refer Section 6.1.2

9. Mitigating and managing impacts

9.1 Flora and fauna management

Mitigation of construction impacts will be specified within a project specific Construction and Environmental Management Plan (CEMP). The following general areas are included in a CEMP but will vary depending on a site's environment and as required by consent conditions:

- Air quality;
- Construction noise and vibration;
- Fill importation;
- Waste management;
- Soil and water plan;
- Erosion and sediment control;
- Flora and fauna management;
- Vegetation management; and
- Biosecurity management

The proposal's potential indirect impacts on biodiversity values will be mitigated through a range of measures, which are to be specified in a fauna and flora management plan (FFMP).

As a subplan to the CEMP, the FFMP will specify biodiversity related procedures, which would include, but may not be limited to, the following:

- Pre-clearance and clearance management;
- Fauna rescue and relocation protocol;
- Euthanasia protocol;
- Dam decommissioning;
- General biosecurity duties;
- Unexpected finds protocol; and
- Monitoring and reporting strategies

9.1.1 Pre-clearance

The pre-clearing process provides a final check for the presence of flora and fauna species and habitat on a site immediately before clearing begins. Pre-clearing surveys are required to:

- Delineate the extent of clearing permitted and prepare site map(s) identifying exclusion zones;
- Identify and record the details of all habitat features (including where applicable: GPS location; species or type of habitat feature) for inclusion on site map(s);
- Mark habitat features that will be cleared, using suitable methods; and
- Locate nearby habitat suitable for the release of fauna that may be encountered during the pre-clearing or clearing stages;
- Locate suitable areas for relocation of habitat features if any (e.g., large woody debris).

9.1.2 Clearing

Where habitat features are identified in pre-clearing surveys, a two-staged clearance process shall be undertaken and an experienced ecologist present to supervise the process, act as a fauna spotter and relocate any fauna captured.

This shall include sufficient notification to proximal veterinarian surgeons and wildlife carers of the intent to commence clearance works and determining nearby locations where any injured or otherwise immature and susceptible fauna may be released.

9.1.3 Basin decommissioning

Basin decommissioning requires a range of management and mitigation measures to comply with the following legislation:

- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Fisheries Management Act 1994* (FM Act);
- *Prevention of Cruelty to Animals Act 1979* (PCA Act); and
- *Biosecurity Act 2015* (Biosecurity Act)

Table 9-1 provides a summary of management and mitigation measures that should be detailed within the FFMP for implementation pre-construction and during the decommissioning process.

Table 9-1. Dam decommissioning requirements

Item	Requirements
Proposed method	<ul style="list-style-type: none"> • It is envisioned that basin water disposal will be reused on-site for dust depression and soil conditioning with recirculation of water on site under current operations.
Environmental protection measures	<ul style="list-style-type: none"> • Details including a plan of all sediment and erosion control measures that will be in place during the dewatering of each basin.
Water quality	<ul style="list-style-type: none"> • The quality of the basin water is to be assessed against ANZECC Guidelines, specifically freshwater 95% level of protection trigger values, but may also require additional values should any discharge to Reedy Creek be necessitated. • Water quality of potential receiving waters in which aquatic fauna will be relocated to, will also need to be assessed to ensure relocation sites provide suitable habitat for aquatic fauna.
Water quantity	<ul style="list-style-type: none"> • Should discharge to Reedy Creek be proposed, details of quantity and flow rate of discharge will be required. • Water levels in each dam will also need to be monitoring to ensure refuge habitat for aquatic fauna is maintained at all times up until the dam is ready for decommissioning and a program in place to capture and relocate aquatic fauna.
Sediment quality	<ul style="list-style-type: none"> • Prior to disturbing the sediment of the dam, the sediment within the dam walls and bed must be assessed against the National Environmental Protection Measure (NEPM) 2013.
Aquatic fauna	<ul style="list-style-type: none"> • Details on the methods that will be used to capture and rescue fauna residing in and around the dam. • Details on how fauna will be rescued from dam sediments or allowed to relocate from the dam. • Proposed relocation sites for native species including a permit under Section 37 of the FM Act for the relocation of fin fish (i.e., introduction of fin fish into watercourses). • Detailed description on the methods for fauna transportation and release. • Methods to prevent injury to fauna during pumping of water from the dam.

Item	Requirements
	<ul style="list-style-type: none"> • Protocols for dealing with any injured native fauna and euthanasia.
<p>Biosecurity risks</p>	<ul style="list-style-type: none"> • Protocols to prevent the spread of diseases and aquatic weed species (depending on the location of the release site). • Details of how exotic pest species will be humanely euthanased in a manner consistent with the PCA Act. • Methods for disposing of dam water and preventing the spread of carp eggs and juvenile pest species into natural waterways. <p>A Biosecurity Management Plan is provided in Appendix D.</p>
<p>Reporting</p>	<ul style="list-style-type: none"> • Details on reporting of actions undertaken with tallies of fauna removed from the dam with details of their relocation destination or euthanasia.

9.2. Adaptive management for uncertain impacts

Not applicable as the proposal is considered unlikely to result in any uncertain impacts that require adaptive management.

10. Thresholds for Assessment

Section 9 of the BAM sets out the impact thresholds that must be applied, which include:

1. Impacts on an entity that is at risk of a serious and irreversible impact;
2. Impacts for which the assessor is required to determine an offset requirement;
3. Impacts for which the assessor is not required to determine an offset requirement; and
4. Impacts that do not require further assessment by the assessor.

10.1. Impacts on serious and irreversible impacts

PCT 849 is identified in the TBDC as a serious and irreversible impact (SAIL) entity. Although only a very small area of planted species constituent of PCT 849 would be impacted by SSD-37486043.

The BAM-C credit reports do not identify PCT 849 within the subject land to be a SAIL entity.

Notwithstanding, cumulative impacts on PCT 849 have been considered in the context of the wider Estate area, which are summarised in Table 10-1 summarises and considered.

summarises past and proposed clearing of PCT 849 within the wider Estate area.

Table 10-1. Cumulative impacts on PCT 849

DA reference	DA title / PCT 849 Condition	Area impacted (ha)
DA 85/2019	Plant 3 Crusher relocation / low condition - planted	0.80
DA 133.2/2019	Stage 1 Oakdale East Estate - clearing of remnant PCT 849	0.10
DA 133.2/2019	Stage 1 Oakdale East Estate / low condition - planted	0.60
DA/347.1/2021	Plant 3 Rehabilitation DA / low-moderate condition - planted and recolonising vegetation	1.02
SSD-37486043	Stage 2 Oakdale East Estate / low condition - planted	0.05
Cumulative total of PCT 849 cleared or proposed to be cleared		2.57

As highlighted in Table 10-1, only 0.10 ha of remnant PCT 849 has been cleared, with the remaining 2.45 ha comprising plant species constituent of PCT 849.

The clearing of 0.8 ha for the Plant 3 Crusher relocation DA did not trigger entry into the NSW Biodiversity Offset Scheme (the Scheme).

The clearing of 0.1 ha of remnant and a further 0.6 ha of planted PCT 849 associated with Stage 1 of the Estate has been offset compliantly under the Scheme.

Future proposed clearing of planted PCT 849 associated with DA/347.1/2021 and SSD-37486043 will also incur offsetting obligations under the Scheme.

Impacts on PCT 849 as a SAIL is documented within DA/347.1/2021, which concluded the following:

- The impact on the geographic extent of PCT 849 equates to a minimum and maximum of 0.009% and 0.003% (respectively) of the minimum (11,200 ha) and maximum (29,813 ha) of the estimated geographic extent of PCT 849;
- PCT 849 within 500m of the subject land, extends over approximately 14.3 ha, which will not be impacted because of the past and future DAs within the subject land;

- There will be negligible if any impact on the distance between isolated areas of the PCT 849 or dispersal distance for native flora species (characteristic of the PCT 849), and any impact on connectivity, fragmentation, or perimeter ratio for the remaining areas of the PCT 849 as a result of the past and future DAs within the subject land.

10.2 Impacts that require an offset

Table 10-2 summarises the impacts that the proposal will incur ecosystem credit obligations. Figure 10-1 shows the locations where ecosystem credits are incurred, and BAM-C credit summary reports provided in Appendix B.

Table 10-2. Ecosystem credit offsetting requirements

ID	Plant community type (PCT)	Area (ha)	Ecosystem credits
PCT 835	Cumberland river-flat forest - moderate condition	0.49	10
PCT 1071	Phragmites australis/Typha orientalis coastal freshwater wetland - artificial basins	0.13	3
PCT 1800	Cumberland swamp oak floodplain forest - moderate condition	0.03	1
		0.65	14

The area of PCT 835 (0.49 ha) was not discounted for potentially providing habitat for the gang-gang cockatoo. This species was assumed to be present and incurs an offsetting obligation of 10 species credits (see Table 10-3, Figure 10-1 and BAM-C credit summary reports provided in Appendix B).

Table 10-3. Species credit offsetting requirements

Species	Habitat condition	Change in habitat condition	Area of impact (ha)	Credits required
<i>Calliocephalon fimbriatum</i> gang gang cockatoo (fauna)	40.8	-40.8	0.49	10

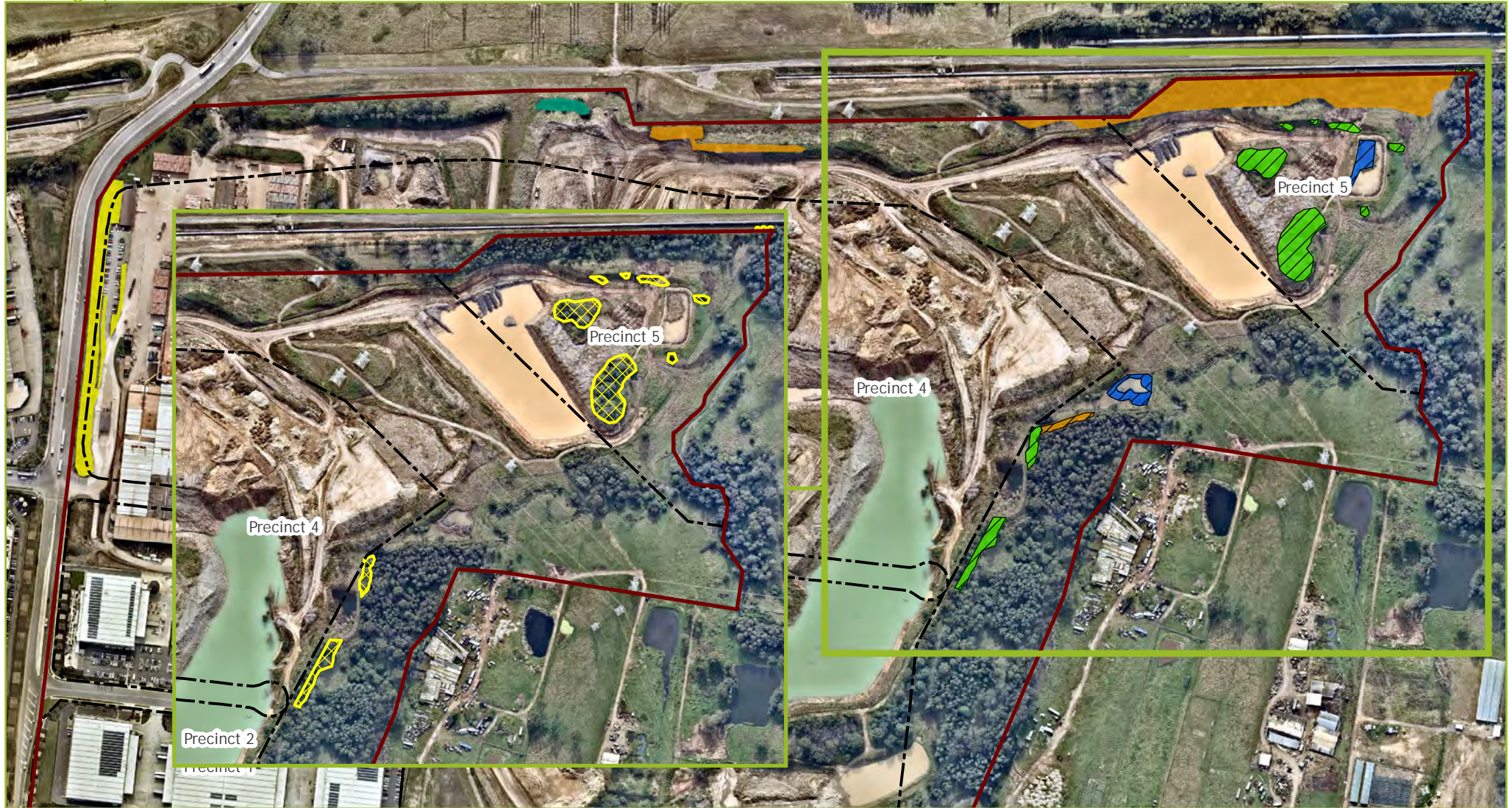
10.3. Impacts that do not require an offset

The areas within the SSD-37486043 footprint that do not require an offset are summarised below:










Credit obligations are not required for the following areas of native vegetation clearing:

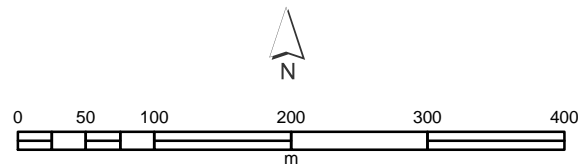
- 0.05 ha of PCT 849: which returned a vegetation integrity score of 14.5 in the BAM-C, which is below the threshold value that triggers and offsetting obligation
- 1.15 ha of PCT 1800: which returned a vegetation integrity score of 10.8 in the BAM-C, which is below the threshold value that triggers and offsetting obligation
- 0.43 ha of landscaping: which in accordance with BAM’s assessment for planted native vegetation (BAM Appendix D), does not incur a credit obligation

Figure 10-2 shows the areas within the SSD-37486043 footprint that are summarised above.



Legend

- | | |
|--|---|
|  Subject_land |  PCT 835 |
|  Precincts |  PCT 849 |
|  Ecosystem offset |  PCT 1071 |
|  Species offset |  PCT 1800 |
| |  Landscaping |



Oakdale East Estate SSD-37486043

Figure 10.1. Offset requirements

Coordinate System: MGA Zone 56 (GDA 2020)

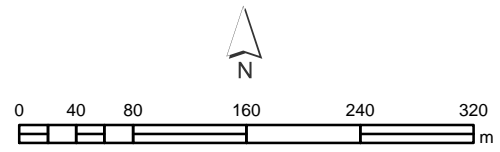
Image sources: Nearmap 19 May 2022

Date prepared: 28 September 2022



Legend

- Precincts
- SP2
- Site boundary
- Electricity_easement
- PCT 849
- PCT 1800
- Landscaping
- Non-native
- Non-vegetated



Oakdale East Estate SSD-37486043

Figure 10.2. Offsets not required

*Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 3 February 2023
Date prepared: 16 March 2023*

11. References

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- écologique (2022) Austral Brick Plant 3 Rehabilitation Biodiversity Development Assessment Report. Prepared for DA/347.1/2021, 6 February 2022
- écologique (2020) Biodiversity Assessment Report - Oakdale East Industrial Estate Stages 2-5. Prepared for DA/133.2/2019
- écologique (2019) Oakdale East Industrial Estate Stage 1 Biodiversity Development Assessment Report. Prepared for DA/347.1/2021, 6 February 2022
- écologique (2019) Austral Brick Plant#3 Crusher Relocation (DA) Biodiversity Assessment. Prepared for DA85/2019, 12 March 2019
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- Tozer (2003) The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities. *Cunninghamia* (2003) 8(1): 1-75
- Tozer M.G, Turner K, Keith D.A, Tindall D, Pennay C, Simpson C, MacKenzie B, Beukers P and Cox S (2010) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands *Cunninghamia* 11(3): 359-406
- Travers Bushfire and Ecology (2014) Flora & Fauna Assessment - CSR Brick Plant, Lot 1 DP 106143 - Old Wallgrove Road, Horsley Park. Prepared 10 March 2014

Appendix A. Transect/plot data



Survey Name: Oakdale East Estate SSDA

11.11.2020

Zone ID: PCT 835 - Zone 1

Plot no: 1

Location:	Zone	Easting	Northing	Bearing
	56H	299987	6255344	77

Vegetation formation:	Vegetation class:	PCT (if known)
Forested Wetlands	Coastal Floodplain Wetlands	835

CONDITION (400m² plot)

Composition:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Native Richness count:	2	0	3	7	0	1

Structure:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Cover of each group:	34	0	16	23.5	0	0.1

High Threat Weed cover: 38.7

FUNCTION (1,000m² plot)

Tree regeneration (<5cm)		Stem classes	
Present		5-9	10
		10-19	31
Absent		20-29	17
		30-49	4

No large trees (>50cm DBH)	No. of HBTs	Length of LWD (m):
2	2	6

FUNCTION (50m transect)

Litter cover	5m	15m	25m	35m	45m	Average
	15	1	10	5	2	7

Survey Name: Oakdale East SSDA

Zone ID: PCT 835 Zone 1 Plot no: 1

GF code	Scientific Name	Common Name	N, E or HTW	Cover	Abund	Stratum
TG	<i>Angophora floribunda</i>	Rough-barked apple	N	30	47	OS
TG	<i>Casuarina glauca</i>	Swamp oak	N	outside plot		OS
TG	<i>Eucalyptus tereticornis</i>	Forest red gum	N	4	3	OS
SG	<i>Melaleuca linearifolia</i>	Narrow-leaved paperbark	N	outside plot		OS
				34		
GG	<i>Echinopogon ovatus</i>	Forest hedgehog grass	N	2	20	US
GG	<i>Lachnagrostis filiformis</i>	Blown grass	N	2	25	US
GG	<i>Microlaeana stipoides</i>	Weeping meadow grass	N	12	50	US
				16		
FG	<i>Cotula coronopifolia</i>	Water ribbons	N	0.1	1	US
FG	<i>Dichondra repens</i>	Kidney weed	N	1.1	20	US
FG	<i>Einadia sp.</i>	seedlings	N	0.1	5	US
FG	<i>Marsilea nutans</i>	Nardoo	N	0.1	10	US
FG	<i>Oxalis perannens</i>	Native oxalis	N	0.1	10	US
FG	<i>Persicaria decipiens</i>	Knot grass	N	20	>1000	US
FG	<i>Plectranthus parviflorus</i>	Cockspur	N	2	25	US
				23.5		
OG	<i>Glycine sp.</i>		N	0.1	5	US
				0.1		
	WEEDS					
	<i>Anagallis arvensis</i>	Scarlet pimpernel	E	0.1	10	US
	<i>Chenopodium album</i>	Fat hen	E	0.1	5	US
	<i>Conyza bonariensis</i>	Fleabane	E	1	10	US
	<i>Cirsium vulgare</i>	Spear thistle	E	2	20	US
	<i>Lolium perenne</i>	Perennial ryegrass	E	5	100	US
	<i>Phytolacca octandra</i>	Inkweed	E	0.1	3	US
	<i>Plantago lanceolatum</i>	Lamb's tongue	E	2	50	US
	<i>Polypogon monspeliensis</i>	Annual beard grass	E	0.1	10	US
	<i>Rumex crispus</i>	Curly-leaf dock	E	2.5	50	US
	<i>Sida rhombifolia</i>	Paddys lucerne	E	15	>1000	US
	<i>Solanum nigrum</i>	Deadly nightshade	E	0.1	4	US
	<i>Solanum pseudocapsicum</i>	Apple of Sodom	E	1	20	US
	<i>Tradescantia jubata</i>	Trad	E	0.1	9	US
	<i>Trifolium repens</i>	White clover	E	3	100	US
	<i>Rumex crispus</i>	Curly-leaf dock	E	2.5	50	US
				34.6		
	<i>Bidens pilosa</i>	Cobblers pegs	HTW	0.1	5	US
	<i>Cestrum parqui</i>	Green cestrum	HTW	0.1	2	MS
	<i>Cyperus eragrostis</i>	Umbrella sedge	HTW	15	>100	US
	<i>Ehrharta erecta</i>	Panic veldt grass	HTW	20	>100	US
	<i>Nassella trichotoma</i>	Serrated tussock grass	HTW	2.5	20	US
	<i>Senecio madagascariensis</i>	Fireweed	HTW	1	100	US
				38.7		

11.11.2020

Survey Name: Oakdale East Estate SSDA

Zone ID: PCT 849 Zone 1

Plot no: 1

Location:	Zone	Easting	Northing	Bearing
	56H	299312	6255571	270

Vegetation formation:	Vegetation class:	PCT (if known)
Grassy woodlands	Coastal Valley Grassy Woodlands	849 - planted

CONDITION (400m² plot)

Composition:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Native Richness count:	2	0	0	2	0	1

Structure:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Cover of each group:	38	0	0	0.1	0	0.1

High Threat Weed cover:

56.6

FUNCTION (1,000m² plot)

Tree regeneration (<5cm)		Stem classes	
Present		5-9	1
		10-19	10
Absent		20-29	9
		30-49	1

No large trees (>50cm DBH)	No. of HBTs	Length of LWD (m):
0	0	0

FUNCTION (50m transect)

Litter cover	5m	15m	25m	35m	45m	Average
	0	0	15	0	5	4

Survey Name: Oakdale East Estate SSDA

11.11.2020

Zone ID: PCT 1800 Zone 1

Plot no: 1

Location:	Zone	Easting	Northing	Bearing
	56H	299926	6255585	89

Vegetation formation:	Vegetation class:	PCT (if known)
Forested Wetlands	Coastal Floodplain Wetlands	1800

CONDITION (400m² plot)

Composition:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Native Richness count:	1	0	1	0	0	0

Structure:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Cover of each group:	20	0	0.1	0	0	0

High Threat Weed cover: 22.75

FUNCTION (1,000m² plot)

Tree regeneration (<5cm)		Stem classes	
Present		5-9	22
		10-19	8
Absent		20-29	5
		30-49	5

No large trees (>50cm DBH)	No. of HBTs	Length of LWD (m):
0	0	0

FUNCTION (50m transect)

Litter cover	5m	15m	25m	35m	45m	Average
	3	0	0	0	0	1

Survey Name: Oakdale East Estate SSDA

Date: 4/05/2022

Zone ID: PCT 1800 Zone 2

Plot no: 1

Location:	Zone	Easting	Northing	Bearing
	56H	299853	6255258	270°

Vegetation formation:	Vegetation class:	PCT (if known)
Forested Wetlands	Coastal Floodplain Wetlands	PCT1800

CONDITION (400m² plot)

Composition:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Native Richness count:	1	1	3	4	0	0

Structure:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Cover of each group:	28	18.75	8.25	2.6	0	0

High Threat Weed cover: 63.85

FUNCTION (1,000m² plot)

Tree regeneration (<5cm)		Stem classes	
Present	YES	5-9	YES
		10-19	YES
Absent		20-29	YES
		30-49	NO

No large trees (>50cm DBH)	No. of HBTs	Length of LWD (m):
0	0	12

FUNCTION (50m transect)

Litter cover	5m	15m	25m	35m	45m	Average
	25	0	15	0	35	15

Survey Name: Oakdale East Estate

Zone ID: PCT 1800 / 2

Plot no: 1

Date: 4/05/2022

GF code	Scientific Name	Common Name	N, E or HTW	Cover	Abund	Stratum
TG	<i>Casuarina glauca</i>	Swamp Oak	N	28	40	OS
			subtotal	28		
SG	<i>Plectranthus parviflorus</i>	Cockspur	N	18.75	75m ²	US
			subtotal	12.5		
GG	<i>Chloris ventricosa</i>	Windmill grass	N	1.25	5m ²	US
GG	<i>Microlaeana stipoides</i>	Weeping meadow grass	N	0.75	3m ²	
GG	<i>Phragmites australis</i>	Common reed	N	6.25	25m ²	US
			subtotal	8.25		
FG	<i>Dichondra repens</i>	Kidney weed	N	2.5	10m ²	US
FG	<i>Persicaria decipiens</i>	Slender knotweed	N	0.1	4	US
FG	<i>Potamogeton ochreateus</i>	Blunt pondweed	N	Outside plot		instream
FG	<i>Triglochin procerum</i>	Water ribbons	N	Outside plot		instream
			subtotal	2.6		
SG	<i>Lycium ferocissimum</i>	African boxthorn	HTW	12.5	50m ²	MS
SG	<i>Lantana camara</i>	Lantana	HTW	12.5	50m ²	MS
GG	<i>Chloris gayana</i>	Rhodes grass	HTW	12.5	50m ²	US
GG	<i>Cyperus eragrostis</i>	Umbrella sedge	HTW	Outside plot		instream
GG	<i>Eragrostis curvula</i>	African lovegrass	HTW	Outside plot		US
GG	<i>Juncus acutus</i>	Sharp rush	HTW	Outside plot		instream
FG	<i>Alternanthera philoxeroides</i>	Alligator weed	HTW	Outside plot		instream
FG	<i>Bidens pilosa</i>	Cobblers peg	HTW	1.25	5m ²	US
FG	<i>Senecio madagascariensis</i>	Fireweed	HTW	0.1	3	US
FG	<i>Tradescantia fluminensis</i>	Trad	HTW	25	100m ²	US
			subtotal	63.85		
SG	<i>Solanum pseudocapsicum</i>	Jerusalem cherry	E	0.1	1	US
GG	<i>Setaria sp.</i>	Pigeon grass	E	1.25	5m ²	US
FG	<i>Brassica sp.</i>		E	0.1	5	US
FG	<i>Conyza bonariensis</i>	Fleabane	E	0.1	7	US
FG	<i>Plantago lanceolata</i>	Lambs tongue	E	0.25	15	US
FG	<i>Rumex crispus</i>	Curled dock	E	Outside plot		instream
FG	<i>Sida rhombifolia</i>	Paddy's lucerne	E	0.25	20	US
OG	<i>Araujia sericifera</i>	Moth vine	E	Outside plot		Aerial
			subtotal	2.05		
			TOTAL	117.25		

GF Code: Growth Form | N: native, E: exotic, HTE: high threat exotic

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

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

Survey Name: Oakdale East SSD

11.11.2020

Zone ID: PCT 1071 Zone 1

Plot no: 1

Location:	Zone	Easting	Northing	Bearing
	56H	299645	6254923	250

Vegetation formation:	Vegetation class:	PCT (if known)
Freshwater Wetlands	Coastal Freshwater Lagoons	1071

CONDITION (400m² plot)

Composition:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Native Richness count:	0	0	1	2	0	0
Structure:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Cover of each group:	0	0	85	0.2	0	0

FUNCTION (1,000m² plot)

Tree regeneration (<5cm)		Stem classes	
Present		5-9	NO
		10-19	NO
Absent	YES	20-29	NO
		30-49	NO

No large trees (>50cm DBH)	No. of HBTs	Length of LWD (m):
0	0	0

FUNCTION (50m transect)

Litter cover	5m	15m	25m	35m	45m	Average
	0	5	10	0	1	3.2

Scientific Name	Common Name	N, E or HTE	Cover (400m ²)		Stratum
			%	Abund	
<i>Typha orientalis</i>	Broadleaf Cumbungi	N	85	>1000	US
		TOTAL	85		

Survey Name: Oakdale East Estate SSD-37486043

Precinct 5 - exotic

Plot no: Zone 1

Zone: 56H Easting 299738 Northing 6255537

CONDITION (400m² plot)

Composition:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Native Richness count:	0	0	1	0	0	0

Structure:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Cover of each group:	0	0	0.1	0	0	0

CONDITION (400m² plot)

GF code	Scientific Name	Common Name	N, E or HTW	Cover	Abundance
GG	<i>Themeda australis</i>	Kangaroo grass	N	0.1	20
Weeds					
SG	<i>Solanum linnaeanum</i>	Apple of Sodom	E	10	80
SG	<i>Solanum nigrum</i>	Black nightshade	E	0.1	3
GG	<i>Briza subaristata</i>		E	2.5	30
GG	<i>Cenchrus clandestinum</i>	Kikuyu	HTW	5	100
GG	<i>Chloris gayana</i>	Rhodes grass	HTW	10	200
GG	<i>Cyperus eragrostis</i>	Umbrella sedge	HTW	5	100
GG	<i>Lolium perenne</i>	Perennial rye grass	E	40	1000
GG	<i>Setaria</i> sp.	Pigeon grass	E	1.5	40
FG	<i>Anagallis arvensis</i>	Scarlet pimpernel	E	0.1	10
FG	<i>Bidens pilosa</i>	Cobblers pegs	HTW	2.5	50
FG	<i>Cirsium vulgare</i>	Spear thistle	E	10	150
FG	<i>Lotus corniculatus</i>	Birdfoot trefoil	E	0.1	10
FG	<i>Plantago lanceolatum</i>	Lambs tongue	E	10	>200
FG	<i>Phytolacca octandra</i>	Inkweed	E	0.1	3
FG	<i>Trifolium repens</i>	Clover	E	2	100
FG	<i>Senecio madagascariensis</i>	Fireweed	HTW	0.25	10
FG	<i>Verbena incompta</i>	Purpletop	E	1	25

Survey Name: Oakdale East Estate SSD-37486043

Precinct 5 - exotic

Plot no: Zone 2

Zone: 56H Easting 300092 Northing 6255436

CONDITION (400m² plot)

Composition:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Native Richness count:	0	0	0	1	0	0

Structure:	Tree	Shrub	Grass grasslike	Forb	Fern	Other
Cover of each group:	0	0	0	0.5	0	0

CONDITION (400m² plot)

GF code	Scientific Name	Common Name	N, E or HTW	Cover	Abundance
FG	Dichondra repens	Kidney weed	N	0.5	c. 2m ²
Weeds					
GG	Cenchrus clandestinum	Kikuyu	HTW	70	>1000
GG	Cyperus eragrostis	Umbrella sedge	HTW	2.5	22
GG	Paspalum dilatatum	Paspalum	HTW	10	>200
GG	Nassella trichotoma	Serrated tussock grass	HTW	2.5	17
FG	Anagallis arvensis	Scarlet pimpernel	E	0.1	2
FG	Plantago lanceolatum	Lambs tongue	E	0.75	30
FG	Rumex crispus	Curly leaved dock	E	0.5	8
FG	Plantago lanceolatum	Lambs tongue	E	1.25	30
FG	Senecio madagascariensis	Fireweed	HTW	0.25	10
FG	Trifolium repens	White clover	E	2.5	>100

Appendix B. BAM summary reports



Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00031464/BAAS17054/22/00031465	Oakdale East Estate SSD-37486043	16/06/2022
Assessor Name	Report Created	BAM Data version *
Kat Duchatel	28/09/2022	54
Assessor Number	BAM Case Status	Date Finalised
BAAS17054	Finalised	28/09/2022
Assessment Revision	Assessment Type	
2	Major Projects	

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
------	----------------------	----------	------------------------------------	--	-----------	-------------------------------------	-----------------------------------	-----------------------	-------------------------	-----------------------------	---------------	-------------------

Cumberland riverflat forest												
1	835_Low-Moderate	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	40.8	40.8	0.49	PCT Cleared - 93%	High Sensitivity to Gain	Endangered Ecological Community	Critically Endangered	2.00		10
										Subtotal	10	
Cumberland shale plains woodland												
2	849_Low-planted	Not a TEC	14.5	14.5	0.05	PCT Cleared - 93%	High Sensitivity to Gain			2.50		0
										Subtotal	0	
Cumberland Swamp Oak riparian forest												
3	1800_Low 01	Not a TEC	10.8	10.8	1.2	PCT Cleared - 60%	High Sensitivity to Gain			1.75		0
										Subtotal	0	

Cumberland Swamp Oak riparian forest												
5	1800_Low-Moderate	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	38.3	38.3	0.04	PCT Cleared - 60%	High Sensitivity to Gain	Endangered Ecological Community	Endangered	2.00		1
										Subtotal	1	
Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion												
4	1071_Low	Not a TEC	41.4	41.4	0.13	PCT Cleared - 75%	High Sensitivity to Gain			2.00		3
										Subtotal	3	
										Total	14	

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAI	Species credits

<i>Callocephalon fimbriatum / Gang-gang Cockatoo (Fauna)</i>									
835_Low-Moderate	40.8	40.8	0.49			Vulnerable	Endangered	False	10
								Subtotal	10

Appendix C. Vegetation Management Plan





Oakdale East Estate SSD-37486043

Vegetation Management Plan

prepared for

Goodman Property
Services (Aust.) Pty Ltd

écologique | environmental consulting

Oakdale East Estate SSD-37486043

Vegetation Management Plan

prepared for

Goodman Property Services (Aust.) Pty Ltd

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22/03/2023

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Revision Schedule

Rev No	Date	Description	Issued to
1	28/09/2022	Vegetation Management Plan for SSD submission	Goodman
2	22/03/2023	Vegetation Management Plan RTS amended	Goodman

Contents

- 1. Introduction 1
 - 1.1 Overview 1
 - 1.2 Site constraints 4
- 2. Site Description 6
 - 2.1 Reedy Creek riparian corridor 6
 - 2.1.1 Precinct 5..... 6
 - 2.1.2 Precinct 4..... 6
 - 2.2 Native Vegetation 8
 - 2.2.1 Plant Community Types..... 8
 - 2.2.2 Flora species 8
 - 2.2.3 Threatening processes 8
 - 2.3 Weed infestations 9
- 3. Restoration Approach 11
 - 3.1 Overview 11
 - 3.2 Assisted Bushland Rehabilitation 11
 - 3.3 Reconstruction through revegetation 12
 - 3.3 Passive Management 12
- 4. Management Actions 13
 - 4.1 Management Zones 13
 - 4.2 Weed Control..... 13
 - 4.2.1 Primary weeding 13
 - 4.2.2 Secondary weeding 13
 - 4.2.3 Maintenance weeding..... 13
 - 4.3 Soil amelioration..... 15
 - 4.4 Mulching/jute matting..... 15
 - 4.4.1 Mulching 15
 - 4.4.2 Jute matting 15
 - 4.5 Planting program 15
 - 4.5.1 Plant procurement 15
 - 4.5.2 Planting procedure..... 16
 - 4.5.3 Practical completion 16
 - 4.5.4 Planting establishment /defects liability 16
 - 4.6 Performance measures 16
 - 4.7 Compliance certification 17
 - 4.8 Monitoring and reporting 17
- 5. Implementation summary 19
- Appendix A. Weeds of the riparian zone 21

Appendix B. Interim Planting Schedule 25

Tables

Table 1-1. Response to SEARs 1
 Table 2-1. PCTs identified within the Reedy Creek riparian corridor 8
 Table 4-1. Anticipated monitoring and reporting requirements 17
 Table 5-1. VMP implementation schedule 19

Figures

Figure 1-1. SSD-37486043 layout 2
 Figure 1-2. Site context 3
 Figure 1-3. Site constraints 5
 Figure 2-1. VMP extent 10
 Figure 4-1. VMP management zones 14

Glossary / Abbreviations

BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BC Reg.	NSW <i>Biodiversity Conservation Regulation 2017</i>
Biosecurity Act	NSW <i>Biodiversity Security Act 2015</i>
CAA	Controlled activity approval
CEMP	Construction Environmental Management Plan
DPE	NSW Department of Planning and Environment
DPE - Water	NSW Department of Planning and Environment - Water (formerly NRAR)
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
NRAR	NSW Natural Resource Access Regulatory
PCT	Plant Community Type
SSD	State Significant Development
TEC	Threatened Ecological Community
VMP	Vegetation Management Plan
VRZ	Vegetated Riparian Zone
WM Act	NSW Water Management Act 2000

1. Introduction

1.1 Overview

Oakdale East Estate (the “Estate”) is a State Significant Development (SSD-37486043) proposed by Goodman Property Services (Goodman). The Estate comprises five precincts, which will provide for industrial warehouses and distribution centres (refer Figure 1-1).

The Estate Stage 1 works were completed in September 2021 and included building and infrastructure works within Precinct 1. SSD-37486043 seeks approval for a Concept Plan across the Estate and approval for Stage 2 of works at the Estate.

The Planning Secretary’s Environmental Assessment Requirements (SEARs) issued for SSD-37486043 include the preparation of a Vegetation Management Plan (VMP). The SEARs, as relevant to biodiversity matters, are summarised in Table 1-1.

Table 1-1. Response to SEARs

SEARs requirement	Response
An assessment of the proposal’s biodiversity impacts in accordance with the <i>Biodiversity Conservation Act 2016</i> and the Biodiversity Assessment Method (BAM), including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted	A BDAR has been prepared and submitted to the Department
An assessment of long-term impacts of detention basins and spill into Reedy Creek	Addressed in the BDAR
Impacts from ancillary infrastructure and noise and lighting impacts on fauna during Operation	Addressed in the BDAR
A VMP for the Reedy Creek riparian corridor	Purpose of this VMP
A biosecurity management plan (BMP)	A BMP has prepared, which details several biosecurity issues also considered in this VMP

The VMP is also required to meet the objectives of the *Water Management Act 2000* (WM Act) through the rehabilitation and restoration of a riparian corridor along Reedy Creek.

Precincts 2, 4 and 5 of the Estate are partially located within areas of ‘waterfront land’, which is defined as the land 40 m from the highest bank of a river, lake or estuary.

A separate Rehabilitation Development Application (DA) approved by Fairfield City Council, will enable the rehabilitation of the site for future development of SSD-37486043. The site has been used for quarrying and brick production since the 1960s. Consequently, stockpile areas, man-made screening bunds and stormwater reservoirs, will be decommissioned under this DA.

The Rehabilitation DA works are limited to Precincts 2, 3 and 4, with works undertaken in Precincts 2 and 4 also located on waterfront land.

A separate Vegetation Management Plan (Rehab VMP) has been prepared to support a controlled activity approval (CAA) application for the Rehabilitation DA.

This Vegetation Management Plan (VMP) has been prepared for those works located on waterfront land within Precincts 4 and 5 (not already considered in the Rehabilitation DA CAA) and with reference to the DPE ‘Guidelines for controlled activities on waterfront land - Riparian corridors (the Guidelines).

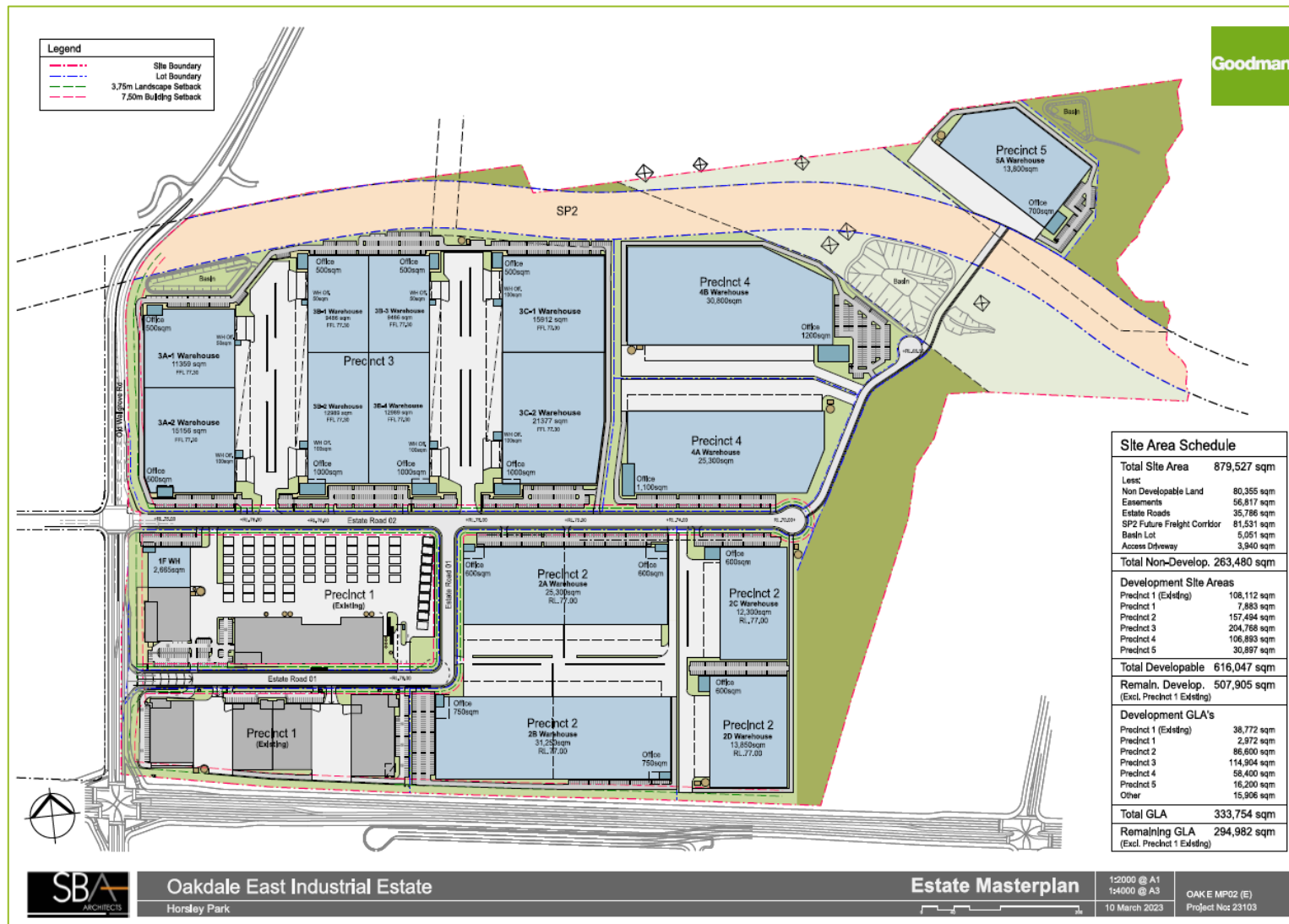


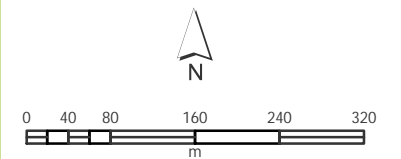
Figure 1-1. SSD-37486043 layout



Figure 1.2. Site context

Legend

- Reedy Creek
- 2nd order
- 2nd order tributary
- 3rd order
- Subject land
- Waterfront_Land



Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 19 May 2022
Date prepared: 18 July 2022

1.2 Site constraints

Site constraints that have been considered in determining the extent of the VMP proposed are shown in Figure 1-3 and outlined below:

- The proposed preferred alignment of the Western Sydney Freight Line (WSFL), which is identified as SP2 zoned land;
- The alignment of the existing electricity easement, which precludes the restoration of a fully structured riparian corridor; and
- The alignment of Reedy Creek, which meanders in and out of Oakdale East's eastern boundary.

The proposed works encroach onto waterfront land in three locations:

- (i) in the southeastern corner of Precinct 2;
- (ii) in the northeastern corner of Precinct 4; and
- (iii) within Precinct 5.

Additionally, the encroachment from an Estate Road onto waterfront land (adjacent Precinct 4) overlaps with works associated with the approved Rehabilitation DA.

The SSD-37486043 works extend further onto waterfront land than that being undertaken by the Rehabilitation DA.

Consequently, management of the riparian restoration adjacent to Precinct 4 is being addressed in this SSD-37486043 VMP.

This enables a clearly defined approach for both the Rehabilitation and SSD-37486043 works, implementation of the VMPs and avoids any logistical overlaps.

Figure 2-1 shows the extent of this VMP, which is considered to be more than commensurate relative to the areas of encroachment onto waterfront land.

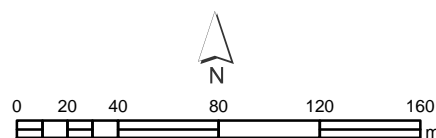


Legend

- Reedy Creek
 - 2nd order
 - 3rd order
- SP2
- Electricity_easement
- Subject land
- Waterfront_land

Oakdale East Estate SSD-37486043 VMP

Figure 1-3. Site constraints



Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 19 May 2022
Date prepared: 22 May 2022

2. Site Description

2.1 Reedy Creek riparian corridor

The Reedy Creek riparian corridor broadly defines the eastern boundary of the Estate although much of the creek itself lies within the neighbouring land to the east. Reedy Creek is a 2nd order Strahler stream order watercourse adjacent to Precinct 4 and a 3rd order Strahler stream order watercourse adjacent to Precinct 5 (see Figure 1-2).

2.1.1 Precinct 5

A 3rd order Strahler stream requires a 30m vegetation riparian zone (VRZ) either side of the stream in accordance with the Guidelines. As ownership of the eastern side of Reedy Creek is predominantly outside of the Estate, the 30m VRZ is only possible from the top of the western bank of Reedy Creek in Precinct 5 and parts of the corridor adjacent to Precinct 4.

The 30m VRZ extends to approximately 10m north of the boundary of SP2 land to allow for future disturbance associated with the construction of the WSFL. The VRZ includes a small section (approximately 8m in length) between the SP2 boundary and a 2nd order tributary that enters Reedy Creek from the east.

2nd order Strahler streams require a 20m VRZ, however given the short length of the riparian corridor beyond the tributary, a 30m VRZ has been maintained.

The extent of the VRZ is approximately 0.85 hectare (ha). Refer Figure 2-1.

2.1.2 Precinct 4

Reedy Creek is a 2nd order Strahler stream adjacent Precinct 4 and requires a 20m VRZ either side of the stream in accordance with the Guidelines.

Construction of the private Estate-road linking Precincts 4 and 5 will temporarily disturb the proposed VRZ in this area. In accordance with the Guidelines the averaging rule has been applied as far as practical.

The averaging rule permits non-riparian corridor works and activities within the outer riparian corridor, so long as the average width of the vegetated riparian zone can be achieved over the length of the watercourse within the development site.

That is, where appropriate, 50 per cent of the outer vegetated riparian zone width may be used for non-riparian (including roads) providing an equivalent area connected to the riparian corridor is offset and the inner 50 per cent of the VRZ must be fully protected and vegetated with native, endemic, riparian plant species.

Construction of the private Estate-road will encroach into the inner 50 per cent of the VRZ. However, the area of encroachment is located where historical filling and basin construction has substantially modified the riparian zone. Photographic plates 1 to 4 provide examples of the modified landform and degraded nature of the land adjacent to the Estate-road.

The lineal length of the encroachment onto waterfront land adjacent to Precinct 4 is approximately 260m and the responding stream length of Reedy Creek is approximately 310m. This equates to an area of 12,400m² or 1.24 ha, in which a 20m riparian width either side of the creek channel is required under the Guidelines.

The total proposed VMP area adjacent to Precinct 4 is 2.23 ha, which includes an additional stream length of approximately 85m and ensures that the total extent of the VMP exceeds what would be required under the averaging rule.

On completion of the road's construction, the embankment (approximately 8m in width and external to the proposed VMP extent) will be planted with indigenous low growing shrubs, grasses and herbaceous groundcover. Thereby providing a contiguous extension of the VMP area above that proposed.



Photo plate 1: example of stockpile adjacent Precinct 4 (viewed from south at north-western corner of riparian corridor where road will be constructed)



Photo plate 2: example of modified landform to east of Photo plate 1 (where construction of road embankment encroach into riparian zone).



Photo plate 3: example of artificial embankment along western boundary of riparian corridor (basin located beyond fenceline in background)



Photo plate 4: artificially created basin to west of Photo plate 3.

2.2 Native Vegetation

2.2.1 Plant Community Types

Investigations and assessment undertaken for the Rehabilitation DA and the Estate SSD identified two plant community types (PCTs) within the corridor, as summarised in Table 2-1.

Table 2-1. PCTs identified within the Reedy Creek riparian corridor

ID	PCT common name	Status	
		BC Act	EPBC Act
PCT 835	Cumberland river-flat forest	Endangered	Critically Endangered
PCT 1800	Cumberland swamp oak floodplain forest	Endangered	Endangered

2.2.2 Flora species

Native flora species observed within the riparian corridor consists of a mosaic of native canopy species dominated by *Eucalyptus tereticornis* (forest redgum) and *Casuarina glauca* (swamp oak) with less frequently occurring *E. moluccana* (grey gum) and *Angophora floribunda* (rough barked apple gum).

Mid stratum species include *Melaleuca stypheloides* (prickly-leaved paperbark) and *Melaleuca linariifolia* (flax-leaved paperbark).

Native ground layer plant species are scattered throughout the riparian corridor and include patches of native grasses such as *Microleana stipoides* (weeping meadow grass) and other herbs such as *Dichondra repens*, *Lobelia purpurascens*, *Brunoniella australis* (Australian bluebell), *Centella asiatica* (Indian pennywort) *Oxalis perennans* *Wahlenbergia gracilis*, *Glycine* spp.

Native aquatic vegetation includes *Phragmites australis* (common reed), *Bolboschoenus fluviatilis* (marsh club-rush), *Potamogeton ochreatus* (pond weed), *Triglochin procerum* (water ribbons), *Persicaria decipiens* (knotweed), *Juncus usitatus* (common rush) and *Alternanthera denticulata* (lesser joy weed).

Typha orientalis (broad-leaf Cumbungi) and *Ludwigia peploides* subsp. *montevidensis* (water primrose) are typically widespread in artificially constructed basins.

2.2.3 Threatening processes

The most significant threatening processes that contribute or have contributed to degradation of the site’s riparian corridors include:

- Past clearing of native vegetation;
- Grazing;
- Weed infestations, and
- Disturbance of soil and soil-stored native seed from various works associated with past land uses and proposed development.

Prior to any clearing being undertaken within the subject site, clearing limits will be clearly delineated, where clearing is adjacent to vegetation that is being retained. The existing natural riparian corridors will be demarcated as ‘no go’ zones and silt fencing installed to prevent movement of sediments in runoff entering these zones, during construction.

The eastern boundary of the riparian zone will be securely fenced to prevent grazing animals and public access from the neighbouring property.

2.3 Weed infestations

Sections of Reedy Creek are infested with *Juncus acutus* (spiny rush) within the channel and lower creek banks along with scattered *Cyperus eragrostis* (umbrella sedge).

Higher elevated creek banks and the riparian corridor support introduced shrubs such as *Rubus fruticosus* (blackberry), *Lantana camara* (lantana) and *Lycium ferocissimum* (African boxthorn) and a groundlayer dominated by introduced grasses and herbaceous weeds.

NSW legislation relevant to the control and management of weed species is the *Biosecurity Act 2015* (the Biosecurity Act), which introduces the premise that biosecurity is a shared community responsibility and introduces the legally enforceable concept of a General Biosecurity Duty (GBD).

Weed infestations will be managed as outlined in this VMP and with priority paid to the GBD under the Biosecurity Act. The Biosecurity Act itself is tenure neutral, in that unlike the previous *Noxious Weeds Act 1993* there is no scheduled “list” of weeds. As such all weeds are categorised by the risk they pose in relation to human health, biodiversity or agricultural production.

The GBD is a key feature of the Biosecurity Act, which means that all private and public land managers (or anyone who deals with weeds) must prevent, eliminate or minimise the risk of those weeds present.

The Greater Sydney Regional Strategic Weed Management Plan 2017-2022 identifies both State level and regionally determined priority weeds and high-risk activities that are relevant to the Estate are listed in Appendix 1.

Biosecurity risks are addressed in a separate Biosecurity Management Plan prepared for the SSD-37486043.



Oakdale East Estate SSD-37486043 VMP

Figure 2-1. Extent of VMP

Legend

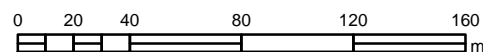
Reedy Creek

2nd order

3rd order

VMP extent

Subject land



Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 16 April 2022
Date prepared: 22 May 2022

3. Restoration Approach

3.1 Overview

The specific objectives of this VMP align with those prescribed in the Guidelines. The main objective being to provide a stable watercourse and riparian corridor which will emulate local native vegetation communities. Specific issues that need to be addressed within this VMP include:

- Conserve and protect environmentally sensitive areas and biodiversity values;
- Restore and rehabilitate degraded bushland and areas of significant vegetation;
- Ensure the protection of threatened species, populations or ecological communities;
- Limit the impact of development upon existing native vegetation;
- Provide habitat connectivity and fauna corridors;
- Promote sustainable vegetation management;
- Undertake responsive site management and landscaping to ensure that bushland values are conserved; and
- Specify appropriate environmental protection works to enhance the ecological and bushland amenity value of the site.

A combination of assisted bushland regeneration and reconstruction through revegetation shall be undertaken in areas of remnant native vegetation within the VMP riparian zones.

3.2 Assisted Bushland Rehabilitation

Assisted bushland regeneration works shall be implemented in areas where natural regeneration is likely, by removing obstacles and making amendments to abiotic conditions to affect the regeneration of remnant native vegetation with varying resilience levels.

The aim of assisted bushland regeneration is to create conditions that favour the ecosystem's own recovery processes. The following principles from OEH's Conservation Management Notes (OEH 2011) apply to this VMP:

- Working where the natives are stronger, i.e., looking after the good areas and creating the conditions that promote their expansion into adjoining more degraded areas. An exception to this approach in the VMP riparian corridors will be targeting priority weed species in accordance with the Biosecurity Act;
- Avoiding excessive disturbance because it often favours weed regrowth. But employing some disturbance where it is needed to trigger native plant regeneration or to treat compacted soils;
- Avoiding mulching (mostly) because mulch suppresses germination of seedlings, although it should be used in the following circumstances:
 - Small, low resilience patches within the regeneration area where natural leaf litter is available from nearby sources, and
 - On the edges of bushland areas to define the limits of the regeneration zone, and to suppress the encroachment of exotic grasses.
 - Above all, mulching shall avoid burying resilient areas where natural recruitment from the soil seed bank is evident and not be applied to areas where base flows are evident.

Management activities relating to the assisted bushland regeneration are detailed in Section 4.

3.3 Reconstruction through revegetation

Reconstruction through revegetation will be undertaken in areas found to have a low capacity for natural regeneration. Relevant to this VMP, reconstruction will be required where areas have been disturbed historically or due to development construction activities.

These areas shall be fully reconstructed through revegetation of canopy, shrub and ground layer plant species constituent of Cumberland river-flat forest communities (PCT 835) and understory species constituent of Cumberland swamp oak forest (PCT1800).

Planting of *Casuarina glauca* (swamp oak) the constituent canopy species of PCT 1800 is not proposed, due to this species already relatively widespread and the following characteristics:

- Rapid clonal growth; and
- Accumulation of the species litter, which typically precludes the establishment of native groundcover species and understorey diversity sought.

Reconstruction activities generally entail the following:

- Targeted weed control of woody weeds, introduced grasses, herbs and forbs;
- Planting of local PCT 835 tree, shrub and groundlayer species; and
- Jute matting or mulching, depending on the location and frequency of inundation.

Section 4 details management activities relating to the reconstruction through revegetation.

3.3 Passive Management

Passive management aims to remove key threatening processes and enable the ecosystem's own recovery processes.

Passive management under this VMP will involve the following:

- Fencing to excluding adjacent landholder's livestock from entering the subject land's riparian zone;
- Control of priority weeds in accordance with the landowner's GBD in compliance with the Biosecurity Act; and
- Control of Weeds of National Significance (WONS).

Appendix A identifies Priority weeds, WONS and other environmental weeds relevant to this VMP.

4. Management Actions

4.1 Management Zones

The VMP applies to three management zones:

- 1) reconstruction through revegetation,
- 2) assisted bushland regeneration, and
- 3) passive regeneration.

Work activities specific to these management zones are summarised in Table 4-1 and detailed in the following Sections with relevant work areas shown in Figure 4-1.

4.2 Weed Control

4.2.1 Primary weeding

Primary weeding is the first stage of bushland regeneration and revegetation, which will require a range of techniques such as: slashing to remove biomass, selective spraying of weeds with herbicides; cutting/scraping and painting deep rooted woody weeds and climbers with hand tools, chainsaws and brushcutters and painting cut stumps with herbicide; and selective hand removal of weeds.

Primary weeding is required in all VMP restoration and regeneration zones with a priority given to species scheduled under the *Biosecurity Act 2015* (see Table A, Appendix A).

Additionally:

- Herbicide shall not be allowed to fall into a watercourse and shall not be applied when wind conditions could cause drift outside the area to be treated or onto desirable plants;
- Damage to native plant species should be avoided during any weeding works; and
- All seed, flowering and invasive vegetative parts of weeds should be bagged and disposed of appropriately off site.

4.2.2 Secondary weeding

Secondary weeding involves the selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover.

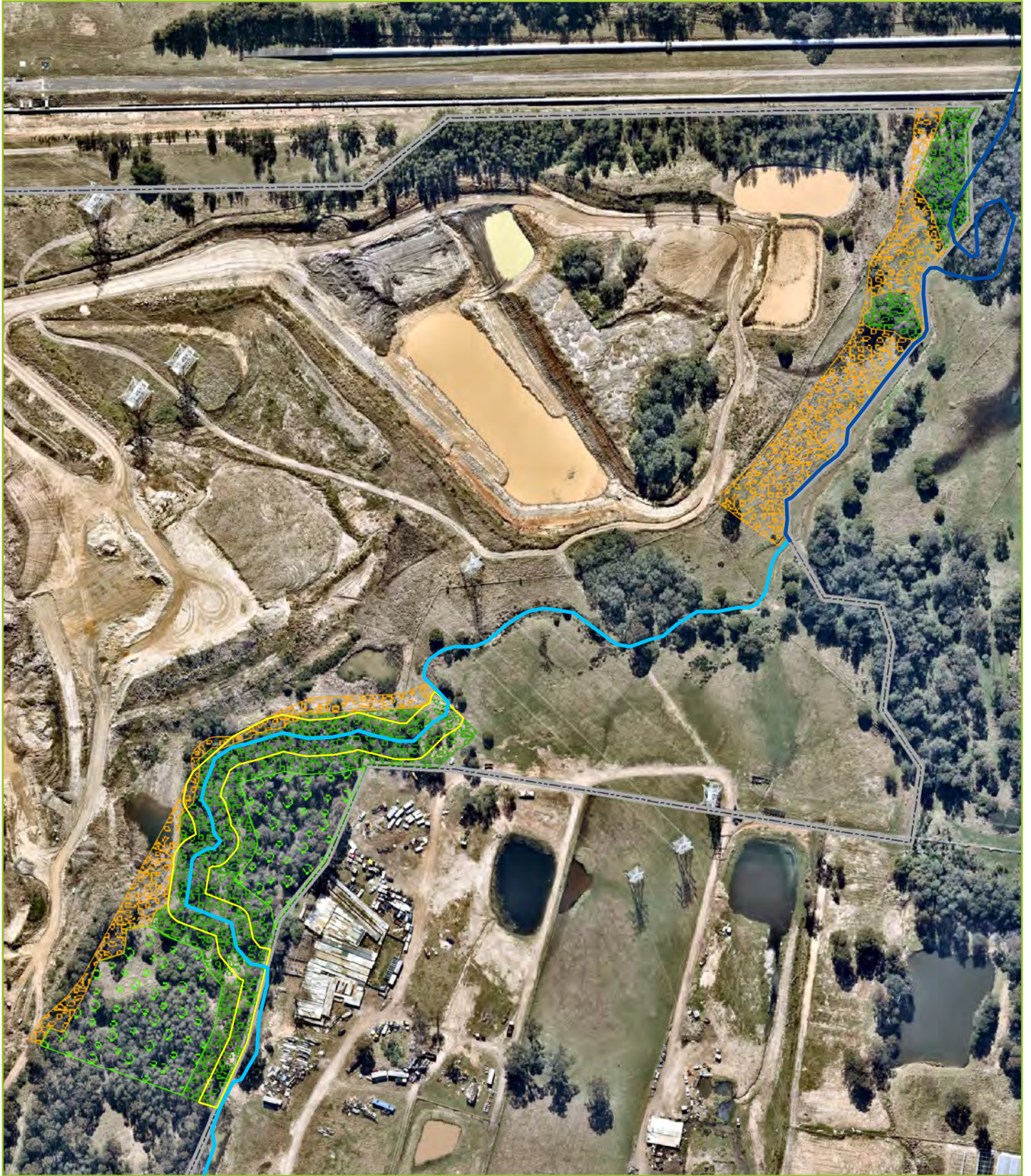
Secondary weeding should be undertaken at intervals of not more than four weeks following the completion of primary weeding and continue throughout the plant establishment period in reconstruction areas and as an ongoing task in assisted bush regeneration areas.

All herbaceous weeds should be managed to be at very-low percentage cover levels, (as a minimum 10% cover), or better. Particularly problematic herbaceous weeds with wind-blown seeds should be prevented from seeding at all times throughout the site.

4.2.3 Maintenance weeding

It can be expected that the remnant and revegetated areas in the riparian zone will always require a certain level of maintenance weeding, as weed seeds and vegetative propagules make their way on site from the soil stored seedbank, via water, wind and bird droppings. However, it can be expected that the amount of weeding required will decrease once the regenerating native plants grow, recover and become more resistant to disturbance and weed colonisation.






Maintenance weeding shall extend for a minimum of two years following practical completion (refer Section 4.5.4 and Table 4-1555) or until such time as a minimum 80% survival rate for all plantings and a maximum five percent (5%) weed cover for each VMP management zone.

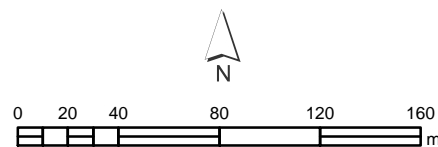


Oakdale East Estate SSD-37486043 VMP

Figure 4-1. VMP Management Zones

Legend

-  Subject land
-  10m_inner_VRZ
- VMP Zone
-  Regeneration
-  Revegetation
-  Passive regeneration



Coordinate System: MGA Zone 56 (GDA 2020)

Image sources: Nearmap 11 September 2022

Date prepared: 28 September 2022

4.3 Soil amelioration

In areas not subject to construction disturbance it is anticipated that existing soils will be suitable for revegetation following weed control without the need for amelioration.

Where construction activities have disturbed site soils (e.g., compaction, loss of topsoil) the following shall apply:

- All debris, stones and left-over building materials (arising from the works) are to be removed from site.
- Stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during excavation or cultivation, must be removed.
- Supply and cultivate/spread 50mm layer of organic compost within 50mm layer of topsoil.
- Organic compost to be pH neutral; low in phosphorus suitable for planting Australian natives; free from clods of soil, rock, rubbish, and other non-organic matter.

4.4 Mulching/jute matting

4.4.1 Mulching

The higher elevated parts of VMP reconstruction zones are to be mulched with a minimum 100mm layer of mulch to assist with weed suppression, improve soil water conservation and soil erosion control. Mulch is to be placed to the required depth, clear of plant stems, and raked to an even surface flush with the surrounding finished levels. Mulch is to be spread so that after settling it is:

- Smooth and evenly graded between design surface levels
- Flush with adjacent finished levels
- Of the required depths (100 mm depth)
- Sloped towards the base of plant stems, but not in contact with the stem

4.4.2 Jute matting

700gm and pre-slitted jute matting is to be installed on creek batters in reconstruction zones.

4.5 Planting program

4.5.1 Plant procurement

Plant procurement involves the sourcing of plant species listed in the Planting Schedule (provided in Appendix B).

Plant procurement shall either be undertaken by Goodman or the Contractor (to be determined on engagement of Contractor).

Most commercial nurseries that supply plant stock to the Western Sydney Region have the capacity to provide suitable seed or other propagative materials (from provenance source) without the need for targeted collection of seed/ propagation materials. However at least six months advance notice will be required to ensure that the species listed the Planting Schedule (provided in Appendix B) are able to be supplied at the intended commencement of planting.

Plant stock is to be inspected by the Contractor or Site Superintendent (or otherwise appointed Goodman representative) at least one month prior to commencement of planting works and again on delivery to the site.

Plants that are not: true to species; vigorous and healthy; with a well-developed root system; free from disease / pests; and are not without scars or dead wood; are to be rejected at delivery.

Planting shall be undertaken immediately after acceptance of plant delivery. If this is not possible: appropriate storage to keep the plants in good condition on the site, adequately protected from frost, wind, sun and vermin, and secured from vandals; shall be facilitated.

4.5.2 Planting procedure

Planting shall generally entail the following:

- Dig hole sufficient for root ball of plant. The removal from the container and the positioning of the plant is to be done with minimum disturbance to the roots.
- Slow-release native plant fertiliser (low phosphorous formulated native plant fertiliser tablet/granules) and water saving crystals shall be placed into the planting hole.
- After planting, the soil shall be replaced and carefully firmed, leaving a slight depression around each plant to allow for water collection. Soil is to be replaced in the hole so that the base of the stem is level with the soil surface, not set below the soil, or sitting above.
- All plants should be watered-in thoroughly after planting to settle any air pockets around the root ball of the plant and to give the plant a good initial supply of water.

4.5.3 Practical completion

It is anticipated that Practical Completion can be achieved within six months from commencement of the bush regeneration/restoration works in each VMP zone. During this time planting establishment is to be achieved through watering, weeding, pest/disease control, replacing dead plant material and repairing/replacing erosion control matting/mulch (as applicable and as required).

All plants should be watered thoroughly on at least 4 to 6 occasions, during this period.

Failure to maintain each VMP management zone in a stable and healthy condition may result in the Superintendent or the Principal arranging for the maintenance work to be carried out by others at the expense of the Contractor.

Practical Completion shall require a minimum 80 per cent survival rate of each species planted and a maximum of:

- 5 per cent weed cover in restoration zones; and
- 10 percent weed cover in rehabilitation zones.

4.5.4 Planting establishment /defects liability

The Plant Establishment / Defects Liability Period shall be in force for 24 months (2 years) after Practical Completion of each stage of the works or until the site is stable, whichever is the longer period.

Any defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or of any other cause, shall be removed and replaced at the Contractor's expense by work or materials of the required standard.

4.6 Performance measures

Performance targets are necessary to objectively measure the progress and the achievement of the VMP objectives.

The anticipated timing of VMP management activities and related performance measures are outlined below and in Table 4-1.

- 1) All environmental and priority weeds are to be continuously suppressed and, if possible, eradicated from the site using recognised appropriate bush regeneration methods in accordance with best practice.

- 2) Weed control and revegetation works are to be carried out by a qualified bushland regeneration contractor.
- 3) Reconstruction specified vegetation communities with a minimum 80% cover of native species achieved.
- 4) Weed control targets of 10% (or less) at the end of the development’s implementation of the VMP (i.e., after 30 months 2½ years)

4.7 Compliance certification

Site audits, monitoring and reporting on the progress and achievement of the VMP performance targets shall be undertaken by the Site Superintendent or other representative nominated by Goodman. In general, reporting and compliance certificates shall be issued for the following items:

- Completion of primary weed control works
- Completion of secondary weed control works
- Inspection of plant materials delivered to site prior to commencement of planting works
- Completion of revegetation planting works (Practical Completion)
- Completion of Defects Liability Period
- Satisfactory achievement of revegetation/restoration works as per VMP performance targets (Section 4.6).

The riparian zone will remain under the ownership and management of Goodman and cared for in perpetuity. As with all other Goodman VMPs (i.e., Oakdale Central, Oakdale South and Oakdale West) following satisfactory completion of the Defects Liability Period, ongoing management and maintenance of the riparian zone will be handed over from Goodman’s Development Team to the Maintenance and Operational Team. This is made clearer in a new VMP Section 4.8

4.8 Monitoring and reporting

Table 4-1 summarise the anticipated monitoring and reporting requirements and frequency of reporting required. The anticipated reporting aligns with the frequency and type of reporting that is currently, and has been, required at other Oakdale Estate VMP sites.

Table 4-1. Anticipated monitoring and reporting requirements

Item	Report type	Frequency	Responsibility
1	Plant procurement	Ltr reports to Principal as follows: <ul style="list-style-type: none"> • Final plant schedule and order confirmed • Nursery inspection (minimum 1 month pre-delivery to site) 	VMP superintendent
2	Site preparation (demarcation of management zones, set up of photographic monitoring sites)	Site inspection and compliance verification (at least once with follow up inspections as required)	VMP superintendent
3	Completion of primary and secondary weed control works	Site inspection and compliance verification (at least once with follow up inspections as required)	VMP superintendent
4	Delivery of plant materials prior to commencement of planting works	To be determined in consultation with nursery and VMP contractor	VMP superintendent / VMP contractor

Item	Report type	Frequency	Responsibility
5	Practical completion (PC) of planting program & installation of irrigation	Site inspection and compliance verification (at least once with follow up inspections as required)	VMP superintendent
6	Completion of plant establishment period (PEP)	Site inspection and compliance verification (at least once with follow up inspections as required)	VMP superintendent
7	Post PEP progress reporting	Submitted monthly with invoicing	VMP contractor
8	Defects Liability Period	Site inspection and compliance verification (at least once with follow up inspections as required)	VMP superintendent
9	Handover	Ltr report to Principal including recommendations and estimate of costs for ongoing maintenance	VMP superintendent

5. Implementation summary

Table 5-1 provides a summary of the VMP’s implementation, noting that this schedule, the scope of works and the planting schedule will be updated for the tendering process to allow for any changed conditions following the removal of grazing animals and other potential development amendments.

Table 5-1. VMP implementation schedule

Task	Timing	Performance measure
Plant procurement	Minimum 4-6mths pre-commencement of VMP implementation	<ul style="list-style-type: none"> Plants that are not: true to species; vigorous and healthy; with a well-developed root system; free from disease / pests; and are not without scars or dead wood; shall be rejected at delivery.
Site preparation (demarcation of management zones, set up of photographic monitoring sites)	At commencement	<ul style="list-style-type: none"> VMP zones clearly demarcated with GPS measurements and photography from monitoring sites provided to the satisfaction of the VMP superintendent
Completion of primary weed control	At commencement - following site preparation	<ul style="list-style-type: none"> 100% of revegetation management zones treated 100% of herbaceous weed control completed in supplementary planting areas of regeneration management zones 50-80% of woody weed control undertaken in regeneration management zones (dependent on habitat provision - to be determined during tender phase)
Completion of secondary weed control	At intervals of not more than four weeks following the completion of primary weeding	<ul style="list-style-type: none"> All areas where primary weed control has been undertaken All herbaceous weeds should be managed to be at very-low percentage cover levels, (as a minimum 10% cover, or better in revegetation management zone). Particularly problematic herbaceous weeds with wind-blown seeds should be prevented from seeding at all times
Completion of revegetation planting works	Practical Completion	<ul style="list-style-type: none"> Mulching or jute matting (supplied & installed) 100% of tubestock and hiko plants installed, including fertiliser and water crystals
Plant establishment	6 months	<ul style="list-style-type: none"> Minimum 90% per cent survival rate of each species planted in all zones Maximum 10% weed cover in reconstruction zones Maximum 20% weed cover in regeneration zones (or as appropriate depending on any retained weed growth for habitat provision)

Task	Timing	Performance measure
Defects Liability Period	24 months	<ul style="list-style-type: none"> • Minimum 80% per cent survival rate of each species planted in all zones • Maximum 5% weed cover in reconstruction zones • Maximum 10% weed cover in regeneration zones
Handover	Between 24-30 months	<ul style="list-style-type: none"> • The riparian zone will remain under the control and management of Goodman. • Following satisfactory completion of the Defects Liability Period, ongoing maintenance of the riparian zone will be handed over from Goodman’s Development Team to the Maintenance and Operational Team.

Appendix A. Weeds of the riparian zone



Species / Common names	GBD measures
Shrubs	
<i>Lantana camara</i> Lantana	<p>Schedule 1: State Priority Weed</p> <p>State Priority Weed Objective - ASSET PROTECTION (Whole of State):</p> <p>Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.</p> <p>Regional Strategic Response: Identify priority assets for targeted management.</p>
<i>Lycium ferocissimum</i> African boxthorn	<p>Schedule 1: State Priority Weed</p> <p>State Priority Weed Objective - ASSET PROTECTION (Whole of State):</p> <p>Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.</p> <p>Regional Strategic Response: Identify priority assets for targeted management.</p>
<i>Olea europaea</i> subsp. <i>cuspidata</i> African olive	<p>Schedule 2: Regional Priority Weed</p> <p>Regional Priority Weeds Objective - CONTAINMENT:</p> <p>Oakdale West lies within the region classified as the core infestation area. The following applies:</p> <p>The plant or parts of the plant are not traded, carried, grown or released into the environment.</p> <p>Implement quarantine and/or hygiene protocols.</p> <p>Surveillance and mapping to locate all infested properties.</p> <p>Monitor change in current distribution to ensure containment of spread.</p> <p>Land managers prevent spread from their land where feasible.</p> <p>Land managers reduce the impact on priority assets.</p> <p>Identify priority assets for targeted management</p>
<i>Rubus fruticosus</i> agg Blackberry	<p>Schedule 1: State Priority Weed</p> <p>State Priority Weed Objective - ASSET PROTECTION (Whole of State):</p> <p>Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.</p> <p>Regional Strategic Response: Identify priority assets for targeted management.</p>
Grasses	
<i>Axonopus fissifolius</i> Carpet grass	Other
<i>Briza subaristata</i> Chilean quaking grass	Other
<i>Bromus catharticus</i> Prairie grass	Other
<i>Ehrharta erecta</i> Panic veldtgrass	Other

Species / Common names	GBD measures
<i>Paspalum dilatatum</i> Paspalum	Other
<i>Pennisetum clandestinum</i> Kikuyu	Other
<i>Sporobolus africanus</i> Parramatta grass	Other
Aquatic and semi-aquatic	
<i>Cyperus eragrostis</i> Umbrella sedge	Other
<i>Juncus acutus</i> Spiny rush	Other
Vines/scramblers	
<i>Anredera cordifolia</i> Madeira vine	<p>Schedule 1: State Priority Weed</p> <p>State Priority Weed Objective - ASSET PROTECTION (Whole of State):</p> <p>Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.</p> <p>Regional Strategic Response:</p> <p>Identify priority assets for targeted management.</p>
<i>Araujia sericifera</i> Moth vine	Other
<i>Asparagus aethiopicus</i> ground asparagus † <i>A. africanus</i> climbing asparagus <i>A. asparagoides</i> bridal creeper <i>A. plumosus</i> climbing asparagus fern	<p>Schedule 1: State Priority Weed</p> <p>State Priority Weed Objective - ASSET PROTECTION (Whole of State):</p> <p>Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.</p> <p>Regional Strategic Response: Identify priority assets for targeted management.</p> <p>†<i>A. africanus</i></p> <p>Destruction of all infestations where feasible.</p> <p>Manage in accordance with New Weed Incursion Plan.</p> <p>▫ Detailed surveillance and mapping to locate all infestations</p>
<i>Asparagus virgatus</i> Asparagus fern	<p>Schedule 3: Local Priority Weed</p> <p>The plant or parts of the plant have not been traded, carried, grown or released into the environment.</p> <p>Surveillance and mapping to locate all infested properties and maintain currency of exclusion zone and objectives.</p>
Herbs	
<i>Anagallis arvensis</i> Scarlet pimpernel	Other
<i>Brassica fruticulosa</i> Twiggy turnip	Other

Species / Common names	GBD measures
<i>Cirsium vulgare</i> Spear thistle	Other
<i>Hypochaeris radicata</i> Catsear	Other
<i>Senecio madagascariensis</i> Fireweed	<p>Schedule 1: State Priority Weed</p> <p>State Priority Weed Objective - ASSET PROTECTION (Whole of State):</p> <p>Mandatory Measure (Division 8, Clause33, Biosecurity Regulation 2017): A person must not move, import into the State or sell.</p> <p>Regional Strategic Response: Identify priority assets for targeted management.</p>
<i>Sida rhombifolia</i> Paddy's lucerne	Other
<i>Solanum americanum</i> American black nightshade	Other
<i>Solanum linnaeanum</i> Apple of Sodom	Other
<i>Sonchus oleraceus</i> Common sowthistle	Other

Appendix B. Interim Planting Schedule



Zone	Species	density/ m ²	%mix	Qty
Precinct 4 reconstruction (2,952m²)				
Trees/large shrubs	<i>Acacia parramattensis</i>	0.05	10	15
	<i>Angophora floribunda</i>	0.05	20	30
	<i>Eucalyptus amplifolia</i>	0.05	20	30
	<i>Eucalyptus moluccana</i>	0.05	10	15
	<i>Eucalyptus tereticornis</i>	0.05	20	30
	<i>Melaleuca styphelioides/linariifolia</i>	0.05	20	30
			100	150
Smaller shrubs	<i>Acacia floribunda</i>	0.2	8	47
	<i>Breynia oblongifolia</i>	0.2	10	60
	<i>Einadia hastata</i>	0.2	8	47
	<i>Dodonaea</i> spp.	0.2	10	60
	<i>Goodenia ovata</i>	0.2	10	60
	<i>Ozothamanthus diosmifolium</i>	0.2	10	60
	<i>Solanum prinophyllum</i>	0.2	8	47
			100	381
	<i>Dichelachne micrantha</i>	3	10	885
	<i>Echinopogon ovata</i>	3	20	1770
	<i>Entolasia marginata</i>	3	10	885
	<i>Imperata cylindrica</i>	3	10	885
	<i>Microlaeana stipoides</i>	3	10	885
	<i>Poa labillardieri</i>	3	20	1770
	<i>Themeda triandra</i>	3	20	1770
			100	8,850
	<i>Carex appressa</i>	1	25	738
Sedges/Sedge-like	<i>Dianella longifolia</i>	1	25	738
	<i>Juncus usitatus</i>	1	25	738
	<i>Lomandra longifolia</i>	1	25	738
			100	2,952
	<i>Brunonella australis</i>	0.05	148	148
	<i>Centella asiatica</i>			
	<i>Clematis glycinoides</i>			
	<i>Commelina cyanea</i>			
	<i>Desmodium varians</i>			
	<i>Dichondra repens</i>			
	<i>Glycine clandestina/tabacina</i>			
	<i>Lobelia purpurescens</i>			
	<i>Oplismenus aemulus</i>			
	<i>Parsonsia straminea</i>			
	<i>Plectranthus parviflorus</i>			
<i>Viola hederacea</i>				
Total plants Precinct 4 reconstruction				12,481

Zone	Species	density/ m ²	%mix	Qty
Precinct 4 regeneration (30% of 10,320m²)				
Smaller shrubs	<i>Acacia floribunda</i>	0.05	8	12
	<i>Breynia oblongifolia</i>	0.05	10	24
	<i>Einadia hastata</i>	0.05	8	12
	<i>Dodonaea</i> spp.	0.05	10	24
	<i>Goodenia ovata</i>	0.05	10	24
	<i>Ozothamanthus diosmifolium</i>	0.05	10	24
	<i>Solanum prinophyllum</i>	0.05	8	12
			100	132
	<i>Echinopogon ovata</i>	2	20	1240
	<i>Entolasia marginata</i>	2	20	1240
	<i>Imperata cylindrica</i>	2	10	620
	<i>Microlaeana stipoides</i>	2	30	1860
	<i>Poa labillardieri</i>	2	10	620
	<i>Themeda triandra</i>	2	10	620
			100	6,200
	<i>Brunonella australis</i>	0.05	132	320
	<i>Centella asiatica</i>			
	<i>Clematis glycinoides</i>			
	<i>Commelina cyanea</i>			
	<i>Desmodium varians</i>			
	<i>Dichondra repens</i>			
	<i>Glycine clandestina/ tabacina</i>			
	<i>Lobelia purpurescens</i>			
	<i>Oplismenus aemulus</i>			
	<i>Parsonsia straminea</i>			
	<i>Plectranthus parviflorus</i>			
	<i>Viola hederacea</i>			
Total plants Precinct 4 revegetation				6,642
Total plants Precinct 4				19,123

Zone	Species	density/ m ²	%mix	Qty
Precinct 5 reconstruction (6,286m²)				
Trees/large shrubs	<i>Acacia decurrens/parramattensis</i>	0.05	10	31
	<i>Angophora floribunda</i>	0.05	20	63
	<i>Eucalyptus amplifolia</i>	0.05	20	63
	<i>Eucalyptus moluccana</i>	0.05	10	31
	<i>Eucalyptus tereticornis</i>	0.05	20	63
	<i>Melaleuca styphelioides/linariifolia</i>	0.05	20	63
			100	314
Smaller shrubs	<i>Acacia floribunda</i>	0.2	20	250
	<i>Breynia oblongifolia</i>	0.2	20	250
	<i>Einadia hastata</i>	0.2	10	125
	<i>Dodonaea spp.</i>	0.2	10	125
	<i>Goodenia ovata</i>	0.2	20	250
	<i>Ozothamanthus diosmifolium</i>	0.2	10	125
	<i>Solanum prinophyllum</i>	0.2	10	100
			100	1225
	<i>Dichelachne micrantha</i>	3	10	18,858
	<i>Echinopogon ovata</i>	3	20	37,716
	<i>Entolasia marginata</i>	3	10	18,858
	<i>Imperata cylindrica</i>	3	10	18,858
	<i>Microlaeana stipoides</i>	3	10	18,858
	<i>Poa labillardieri</i>	3	20	37,716
	<i>Themeda triandra</i>	3	20	37,716
			100	188,580
	<i>Carex appressa</i>	1	25	1,572
Sedges/Sedge-like	<i>Dianella longifolia</i>	1	25	1,572
	<i>Juncus usitatus</i>	1	25	1,572
	<i>Lomandra longifolia</i>	1	25	1,572
			100	6,288
	<i>Brunonella australis</i>	0.05	100	314
	<i>Centella asiatica</i>			
	<i>Clematis glycinoides</i>			
	<i>Commelina cyanea</i>			
	<i>Dichondra repens</i>			
	<i>Glycine clandestina/tabacina</i>			
	<i>Lobelia purpurescens</i>			
	<i>Oplismenus aemulus</i>			
	<i>Parsonsia straminea</i>			
	<i>Plectranthus parviflorus</i>			
<i>Viola hederacea</i>				
Total plants Precinct 5				196,721

Appendix D. Biosecurity Management Plan





Oakdale East Estate
SSD-37486043

Biosecurity Management Plan

prepared for

Goodman Property Services (Aust.) Pty Ltd

Oakdale East Estate SSD-37486043 - Biosecurity Management Plan

prepared for

Goodman Property Services (Aust.) Pty Ltd

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Revision Schedule

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1	28/09/2022	Biosecurity Management Plan for submission	Goodman

Contents

1. Introduction	1
1.1 Background	1
2. Site Description	3
2.1 Overview	3
2.2 Biosecurity risks.....	3
2.2.1 Priority weeds	3
2.2.2 Pest species	4
3. Weed Control.....	6
3.1 Weed control	6
3.1.1 Mechanical removal methods	6
3.1.2 Chemical treatment of weeds	6
3.1.3 Disposal of weeds	7
4. Aquatic Pest Species	7
4.1 Dam decommissioning.....	7
4.2 Spread of aquatic pest species	8
5. Pathogens and disease.....	8
4.1.1 Phytophthora die-back (<i>Phytophthora cinnamomi</i>)	8
4.1.2 Myrtle rust (<i>Puccinia psidii</i>)	8
4.1.3 Chytrid fungus	8
6. Hygiene Protocols	9
6.1 Site inductions	9
6.2 Biosecurity hygiene protocol	9
7. References.....	11

Tables

Table 1-1. Response to SEARs	1
Table 2-1. Priority and environmental weeds and WoNS observed within the subject site.....	3
Table 6-1. Hygiene protocol.....	9

Figures

Figure 1-1. Masterplan (SBA May 2022).....	2
Figure 2-1. Site context	5

1. Introduction

1.1 Background

Oakdale East Estate (the “Estate”) is a State Significant Development (SSD-37486043) proposed by Goodman Property Services (Goodman). The Estate comprises five precincts, which will provide for industrial warehouses and distribution centres (refer Figure 1-1).

The Estate Stage 1 works were completed in September 2021 and included building and infrastructure works within Precinct 1. SSD-37486043 seeks approval for a Concept Plan across the Estate and approval for Stage 2 of works at the Estate.

A separate Rehabilitation Development Application (DA) approved by Fairfield City Council (Council), will enable the rehabilitation of the site for future development of SSD-37486043.

The Planning Secretary’s Environmental Assessment Requirements (SEARs) issued for SSD-37486043 include the preparation of a Biosecurity Management Plan (BMP), as summarised in Table 1-1.

Table 1-1. Response to SEARs

SEARs requirement	Response
An assessment of the proposal’s biodiversity impacts in accordance with the <i>Biodiversity Conservation Act 2016</i> and the Biodiversity Assessment Method (BAM), including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted	A BDAR has been prepared and submitted to the Department (écologique (2022a))
An assessment of long-term impacts of detention basins and spill into Reedy Creek	Addressed in the BDAR
Impacts from ancillary infrastructure and noise and lighting impacts on fauna during Operation	Addressed in the BDAR
A Vegetation Management Plan (VMP) for the Reedy Creek riparian corridor	A VMP has prepared and submitted to the Department écologique (2022b)
A Biosecurity Management Plan (BMP)	Purpose of this BMP

This BMP will form part of the Construction Environmental Management Plan (CEMP) developed for SSD 37486043 Oakdale East Estate - Stage 2 (the Project).

A separate BMP for the Rehabilitation DA (écologique 2022c) has been approved by Fairfield City Council (Council), which is limited to Precincts 2, 3 and 4.

This BMP addresses biosecurity issues not already considered in the Rehabilitation DA BMP, notwithstanding that there are overlaps between the two plans.

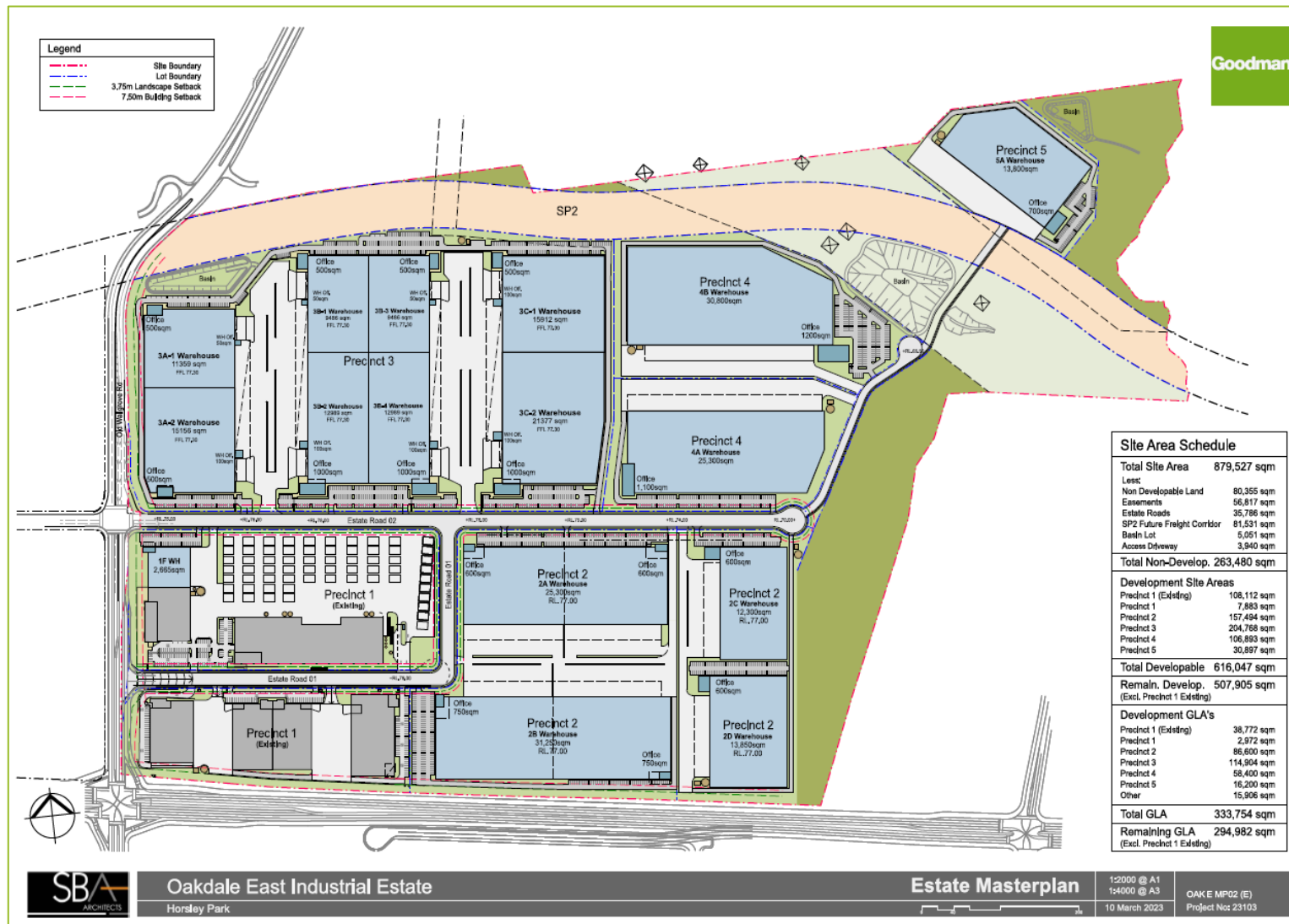


Figure 1-1. SSD-37486043 layout

2. Site Description

2.1 Overview

The Austral Brick Co. Pty Ltd (Austral Brick) has operated the subject site as a plant and quarry for brick production since 1973. Prior to this time the area was extensively cleared for farming purposes.

Consequently, stockpile areas, man-made screening bunds, containment cells and stormwater basins, are being decommissioned under the Rehabilitation DA.

Substantial alterations to the landform have occurred through quarrying activities with most of the subject site consisting of bare disturbed soils and limited vegetation growth. The exception being remnant native vegetation located along the eastern site portion associated with the Reedy Creek riparian corridor.

Management of remnant native vegetation within the Reedy Creek riparian corridor is addressed in the Project’s Vegetation Management Plan (VMP).

Figure 2-1 shows the site context.

2.2 Biosecurity risks

Biosecurity is the protection of the economy, environment and community from the negative impacts of pests and diseases, weeds and contaminants.

Biosecurity risks relevant to the Project include priority weeds, feral and pest animals, and the potential introduction and spread of pathogens and disease.

The *Biosecurity Act 2015* (the Biosecurity Act) introduces the premise that biosecurity is a shared community responsibility and introduces the legally enforceable concept of a General Biosecurity Duty (GBD). The GBD means that any person dealing with a biosecurity risk must take measures to prevent, minimise or eliminate the biosecurity risk (as far as is reasonably practicable).

2.2.1 Priority weeds

The Greater Sydney Regional Strategic Weed Management Plan 2017-2022 (LLS 2019) identifies both State level and regionally determined priority weeds and high-risk activities. Priority weeds identified in the subject site during pre-clearance surveys must be shown on FFMP constraints mapping.

Priority weeds identified during biodiversity assessments are identified in Table 2-1. Species that are listed as Weeds of National Significance (WoNS) are also outlined.

Table 2-1. Priority and environmental weeds and WoNS observed within the subject site

Scientific name	Common name	Biosecurity Act Biosecurity Duty	WoNS
<i>Cortaderia selloana</i>	Pampas grass	General Biosecurity Duty	
<i>Eragrostis curvula</i>	African lovegrass	General Biosecurity Duty	
<i>Lantana camara</i>	Lantana	General Biosecurity Duty	
<i>Lycium ferocissimum</i>	African boxthorn	General Biosecurity Duty	
<i>Olea europaea</i> subsp. <i>cuspidata</i>	African olive	Regional Recommended Measure An exclusion zone is established for all lands in Blue Mountains City Council and Central Coast local government areas. The remainder of the region is	

Scientific name	Common name	Biosecurity Act Biosecurity Duty	WoNS
		classified as the core infestation area. Whole region: The plant or parts of the plant are not traded, carried, grown or released into the environment. Core infestation area: Land managers prevent spread from their land where feasible.	
<i>Opuntia stricta</i>	Common prickly pear	General Biosecurity Duty	
<i>Ricinus communis</i>	Castor oil plant	General Biosecurity Duty	
<i>Rubus fruticosus species aggregate</i>	Blackberry	General Biosecurity Duty	YES
<i>Senecio madagascariensis</i>	Fireweed	General biosecurity duty	YES

2.2.2 Pest species

The most common pest species within the locality are foxes, goats, hares, feral cats and aquatic pest species that may occur in the subject site’s waterbodies.

Goats have historically roamed freely throughout the subject site but this has been arrested through perimeter fencing.

European red fox and hares are evident within the subject site through both observations and remote camera video footage (deployed during biodiversity investigations).

In the absence of coordinated control programs that include neighbouring properties (at a minimum), isolated control methods within the subject site will not be effective. However, terrestrial habitat for dens or warrens have or are being removed through the rehabilitation works and remnant bushland is located on flood prone land (which limits the viability of dens or warrens). On this basis, it is anticipated that these pest species will be less prevalent post development.

Aquatic pest species include *Cyprinus carpio* (European Carp) and *Gambusia holbrooki* (Eastern Gambusia or Plague Minnow).

Oakdale East Estate SSD-37486043

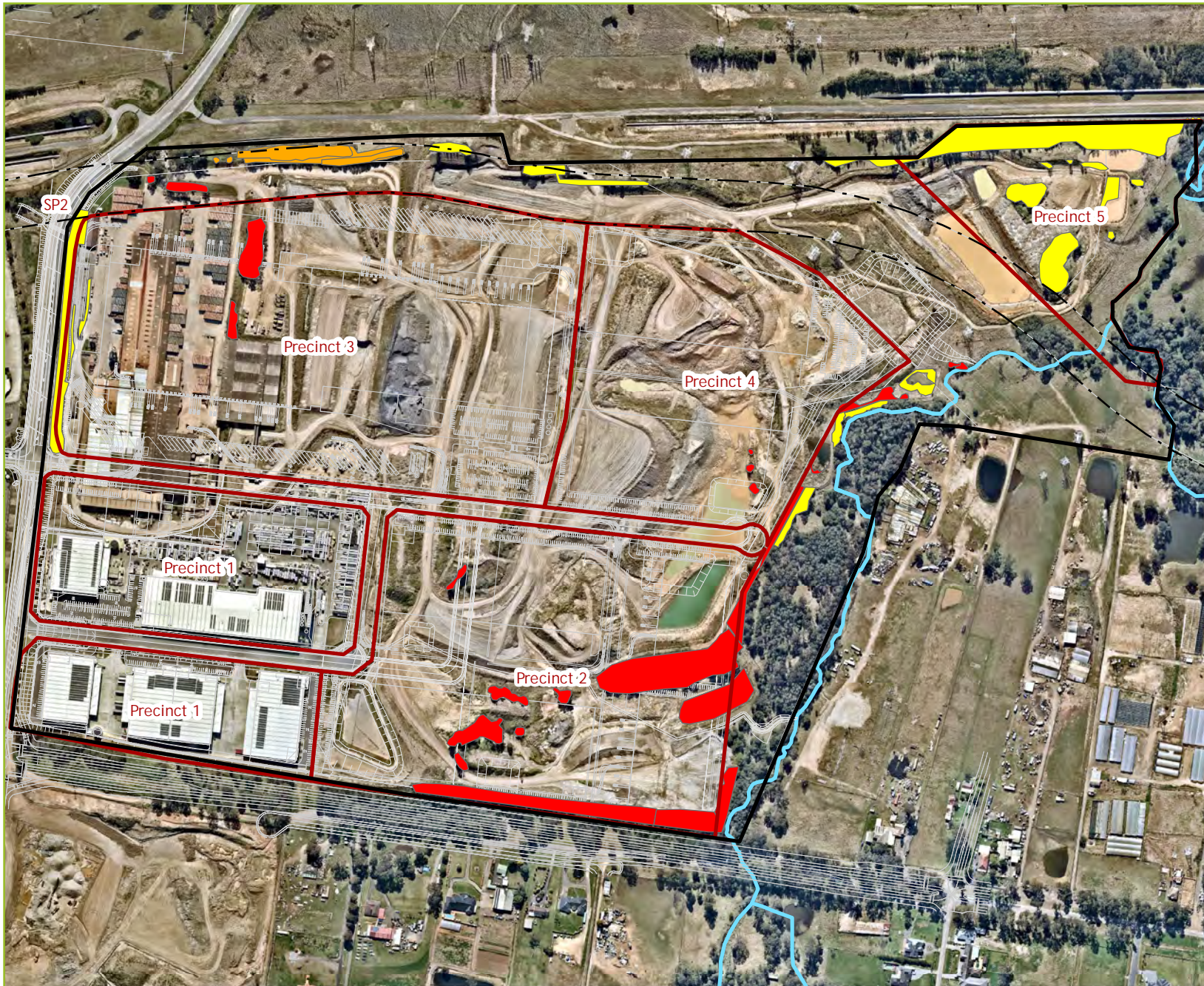
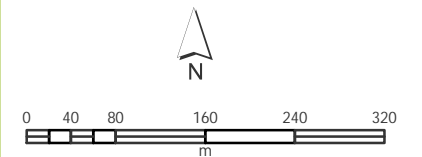


Figure 2.1. Site context

Legend

- Subject land
- Precincts
- Future freight corridor
- Vegetation clearing**
- DA/347.1/2021_approved
- DA/85/2019 approved
- SSD 37486043_proposed
- Reedy Creek



Coordinate System: MGA Zone 56 (GDA 2020)
Image sources: Nearmap 11 September 2022
Date prepared: 25 September 2022

3. Weed Control

3.1 Weed control

The subject site is largely unvegetated quarry areas, stockpiles and haul roads. Weed growth within the subject area is mainly found on screening bunds and in the understorey of remnant native vegetation patches.

The following mitigation measures should be implemented to ensure that the contractor's biosecurity duty is fulfilled and spread of existing weeds or introduction of new weed infestations is prevented.

- The re-use of topsoil and mulch from areas on site should be guided by constraints mapping which should be prepared in association following pre-clearance surveys (conducted for native vegetation clearing). Constraint mapping will identify locations that contain:
 - Priority weeds that should be controlled prior to earthworks
 - Woody weeds that should not be used for mulching once chipped
 - Habitat areas that may require two staged clearing and be left until after all surrounding vegetation has been cleared
- Control drainage that may contain weed seeds or high levels of nutrients.
- Dye used in herbicide spraying, hydroseeding and hydro mulching applications must be a biodegradable, red or green coloured vegetable dye, as applicable.
- Hygiene protocols should be implemented to ensure that plant and machinery enter / leave the site clean to prevent the spread of weed species.
- Monitoring of the site and general surrounds for weed infestations should be undertaken for the duration of the Project.

3.1.1 Mechanical removal methods

Given the volume of cut and fill (earthworks) required, it is anticipated that most weed control will be undertaken through mechanical methods.

Mechanical techniques include:

- Mowing or slashing used where feasible to reduce biomass.
- Excavators or bulldozers to be used to remove larger trees and root systems. Stumps are to be ground out of the soil.
- Slashers or bulldozers to be used to remove shrubby weeds.
- Seedlings or regrowth of weed species can be slashed.
- Excavators or bulldozers to be used to remove and stockpile topsoil layers containing weeds.

3.1.2 Chemical treatment of weeds

- Herbicide application is to be administered by authorised personnel only (ChemCert Accreditation AQF 3), in accordance with Workcover requirements, the *Pesticides Act 1999*, label directions and any relevant industry codes of practice.
- A Records Sheet must be completed within 24 hours of applying the herbicide and a copy submitted to the Project Environmental Representative.
- All personnel managing and using herbicides must receive appropriate training prior to commencing work.
- Only herbicides registered for use near water may be used near water.

- Avoid applying herbicides: (i) on hot days when plants are stressed. (ii) after seed has set. (iii) within 24 hours of rain or when rain is imminent. (iv) when winds will cause drift of herbicides into non-target areas.

3.1.3 Disposal of weeds

- Where weeds cannot be effectively destroyed prior to topsoil stripping, contaminated topsoil shall be either encapsulated by deep burying, or disposed of at an approved off-site facility.
- Any exotic vegetation not able to be incorporated into the Works must be removed from the Construction Site.
- Transport must be covered to further reduce the potential for spread of weed propagules.
- Disposal must be in accordance with the Waste Management Plan.
- Mulch or soils generated from locations that contain high-risk weeds should not be reused on the Project site unless encapsulated.
- Encapsulation meaning burial away from any pavement, structure, watercourse or drainage path with a cover of inert fill of a minimum 500 mm compacted thickness covered with fill. Inert fill must be:
 - from the specified earthworks, and
 - free of any material with a particle size exceeding 75 mm
 - spread uncontaminated topsoil over the burial area and revegetate within 7 days

4. Aquatic Pest Species

4.1 Dam decommissioning

Two artificial basins (dams) are located within the subject site, which will require decommissioning as part of the SSD works.

Aquatic pest species that could be encountered include:

- *Cyprinus carpio* (European carp)
- *Gambusia holbrookii* (eastern Gambusia, plague minnow)
- *Trachemys scripta elegans* (red-eared slider turtle)

Pest fish will be euthanased in the manner most appropriate to the fish species encountered and disposed of, if required, at a landfill site. Pest fish may be euthanized using an overdose of Aqui-S, which anesthetises the fish with the overdose continuing to take the individual through to medullary collapse and subsequently death.

Small-bodied fish species that may be captured in high abundances, such as Eastern Gambusia, may be euthanized via hypothermal euthanasia. Hypothermal euthanasia involves the depression of the fish in an ice slurry at a temperature of 2-4 Celsius. The fish is to come into contact with the chilled water as quickly as possible and not come into direct contact with the ice. This may lead to the development of internal ice crystals.

Large specimens of Carp or Goldfish may be required to be euthanized using blunt force trauma or percussive stunning. Percussive stunning involves a sharp blow to the head in the area just above the eyes (the area adjacent to the brain) using a special tool such as a heavy wooden handle or a priest.

When applied correctly the fish's gill covers should stop rhythmically moving and the eye should remain still. Percussive stunning is considered a good approach provided it is done swiftly and delivered to the correct area.

If the exotic Red-eared Slider Turtle *Trachemys scripta elegans* is identified, individuals are to be captured and humanely contained. The DPI Biosecurity Line (1800 680 244) is to be contacted to report the sighting and advise whether DPI will collect the specimens.

4.2 Spread of aquatic pest species

Eastern Gambusia and European carp eggs are capable of surviving in mud, which may be transported into the site on plant and machinery.

Hygiene protocols should be implemented to ensure that plant and machinery enter / leave the site clean to prevent the introduction and/or spread of these species.

Refer Section 6 for hygiene protocols.

5. Pathogens and disease

No evidence of pathogens or disease has been observed within the subject site. However, pathogens and disease are easily spread on vehicles and plant and the risk of their introduction and spread cannot be discounted.

Pathogens and disease of concern relevant to the subject site are described below and the risk of their introduction shall be minimised through implementation of the hygiene protocols detailed in Section 6.

4.1.1 Phytophthora die-back (*Phytophthora cinnamomi*)

Phytophthora die-back (*Phytophthora cinnamomi*) is a soil borne pathogen that attacks the roots of susceptible plants—destroying the root system and reducing the ability of the plant to absorb water and nutrients. This causes symptoms referred to as ‘dieback’ which can lead to plant death. Under favourable conditions *Phytophthora* spp. can spread easily and quickly, destroying plants and plant communities (Commonwealth of Australia 2014, 2015, 2018).

P. cinnamomi spreads through soil, water and organic matter. It can remain dormant for long periods during dry weather and is impossible in most situations to eradicate from infested areas, which means limiting further spread is critical (Commonwealth of Australia 2015).

Plant families most susceptible are Myrtaceae, Proteaceae, Fabaceae, Epacridaceae and Dilleniaceae. With the exception of the Dilleniaceae, this reflects the dominance of these families in the woody flora of Australia and their importance as structural components in the affected communities (Commonwealth of Australia 2014).

4.1.2 Myrtle rust (*Puccinia psidii*)

Myrtle rust is a disease caused by the fungus *Puccinia psidii* that affects trees and shrubs attacking young, soft, actively growing leaves, shoot tips and young stems, as well as fruits and flower parts. Plants susceptible to myrtle rust are those in the Myrtaceae family, which includes bottle brush (*Callistemon* spp.), tea tree (*Melaleuca* spp. and *Leptospermum* spp.), lilly pillies (*Syzygium* spp.) and eucalypts (*Eucalyptus* spp., *Angophora* spp. and *Corymbia* spp.).

Myrtle rust spores can spread easily via contaminated clothing, hats, footwear, equipment or vehicles. It can also be spread by infected plant material, insects and other animals, or the wind. It is impossible to eradicate myrtle rust from infested bushland, so limiting further spread is also critical (Commonwealth of Australia 2015).

4.1.3 Chytrid fungus

Chytrid fungus attacks keratin in frog's skin, which results in breathing difficulties. The fungus also damages the nervous system, affecting the frog's behaviour. Chytrid fungus may be spread on footwear and vehicle tyres and could be spread by construction activities.

Chytrid fungus is probably transferred by direct contact between frogs and tadpoles, or through exposure to infected water. However, humans have the potential to spread the pathogen further and

faster than any other vector, through the movement of infested soil, water, or infected frogs and tadpoles (DECCW 2009).

The disease may not kill frogs immediately, and they can swim or hop to other areas before they die, spreading fungal spores to new ponds and streams.

6. Hygiene Protocols

6.1 Site inductions

Management, contractors and employees are required to fulfil their general biosecurity duty (GBD), which may simply be to ensure that their vehicles, boots and equipment are clean of any potential biosecurity risks.

It is expected that management, contractors and employees should know all biosecurity risks associated with the industry, business and relevant day-to-day work activities.

The presence or potential for biosecurity risks within the subject site will be addressed at a project level during site inductions, and the biosecurity protocol below is to be presented to all contractors and its requirements made clear.

Toolbox talks are to discuss specific biosecurity issues and requirements relating to work areas as determined through pre-clearing surveys undertaken as specified within the Project Flora and Fauna Management Plan (écologique (2022b)).

6.2 Biosecurity hygiene protocol

All contractors are to follow the hygiene protocol detailed below in Table 6-1 prior to clearing, during construction and post-construction.

Table 6-1. Hygiene protocol

Protocol	Timing
Pre-start site inductions:	
Relevant biosecurity risks are to be discussed during toolbox talks.	Pre-start
In general:	
<ul style="list-style-type: none"> Minimise work during wet/rainy periods. Vehicle/machine hygiene inspections are to be undertaken prior to works starting to determine if vehicles are free from soil and plant material. Tools to be cleaned free of soil and plant material prior to bringing tools to site or moving between works areas. Permanent or semi-permanent vehicle wash-down facilities may be constructed where machinery and vehicles require routine cleaning for fixed activities Truck wash down, rumble grids to be installed and operated to ensure mud, weeds or pathogens are not transported around the region or onto roads. Mud spilt on roads to be immediately removed by a road sweeper. 	At all times
Weeds and Pathogens	
Contractors that have recently engaged in work activities where Phytophthora or Myrtle rust are known to occur must ensure that infected soil, water and/or plant material are removed from machinery, vehicles, equipment and footwear	Prestart
Any soil, plants or other materials entering the site should conform to Australian Standards—for example, AS3743-2003 Potting mixes or AS4454-2012 Composts, soil conditioners and mulches.	At all times

Protocol	Timing
Chytrid fungus	
Contractors that have recently engaged in work activities where the Chytrid fungus is known to occur must ensure that hygiene protocols include disinfection of work boots, car/plant wheels and tyres with benzalkonium chloride (an active ingredient to commercially available products such as 'toilet duck').	Prestart
Frogs rescued from each dam are to be inspected for any symptoms of Chytrid fungus by the Project ecologist and transported from the site in accordance with hygiene protocols for the control of disease in frogs (DECC 2008).	Dam decommissioning
<p>Relevant biosecurity risks are to be discussed during toolbox talks.</p> <p>Tools to be cleaned free of soil and plant material prior to bring tools to site or moving between works areas.</p>	Pre-clearance and prestart
Vehicles/machines must pass the hygiene inspection prior to works commencing, additional cleaning may be required to achieve this.	

7. References

Commonwealth of Australia (2018) Background document: Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi*.

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Commonwealth of Australia (2015) 'Arrive Clean, Leave Clean' Guidelines to help prevent the spread of invasive plant diseases and weeds threatening our native plants, animals and ecosystems.

<https://www.awe.gov.au/sites/default/files/documents/arrive-clean-leave-clean.pdf>

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