Yiribana Logistics Estate

Biodiversity Development Assessment Report

GPT Group Pty Ltd

30 April 2021

Final

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Report No. 19200RP1

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

Version	Date Issued	Amended by	Details
001	23/04/2021	MF, CE, GK	Draft
002	30/04/2021	MF	Final

Approved by:	**Dr David Robertson**
Position:	Director
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Date:	30 April, 2021

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Glossary

Term / Abbreviation	Definition
AHD	Australian Height Datum
AOBV	Area of Outstanding Biodiversity Value
Assessment area	Area of land within a 1500 m buffer around the outer boundary of the subject land
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Regulation	NSW *Biodiversity Conservation Regulation 2017*
BCT	Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CBD	Central Business District
CPCP	Cumberland Plain Conservation Plan
CPW	Cumberland Plain Woodland
DAWE	Commonwealth Department of Agriculture, Water and the Environment
EEC	Endangered Ecological Community
EES	Environment, Energy and Science Group
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
NRAR	National Resources Access Regulator
NSW	New South Wales
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
the Project	Proposed development of the Mamre Road Precinct, Kemps Creek
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy
SSD	State Significant Development
Subject land	The land proposed as a development site (see **Figure 3**)
TEC	Threatened Ecological Community

Term / Abbreviation	Definition
WM Act	NSW *Water Management Act 2000*
WSEA	Western Sydney Employment Area

1. Introduction

Cumberland Ecology was commissioned by GPT Group Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed development of the Yiribana Logistics Estate located at Mamre Road, Kemps Creek (the 'project'). The project involves the demolition of existing structures and removal of vegetation to allow for the construction of five warehouses and associated infrastructure. This BDAR will form part of the required Environmental Impact Statement (EIS) to support an application for a State Significant Development (SSD) under Part 4, Division 4.7 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1. Requirement for BDAR

The project is classified as SSD under Clause 20 of Schedule 1 of State Environmental Planning Policy (State and Regional Development) 2011, as the Capital Investment Value of the project exceeds $30 million.

Section 7.9 of the NSW *Biodiversity Conservation Act 2016* (BC Act) requires all SSD applications for Development Consent to be accompanied by a BDAR unless both the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values. A waiver has not been sought for the Project, and therefore this BDAR has been prepared.

1.2. Purpose

The purpose of this BDAR is to document the findings of an assessment undertaken for the project in accordance with Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM. Specifically, the objectives of this BDAR are to:

- Identify the landscape features and site context (native vegetation cover) within the subject land and assessment area;
- Assess native vegetation extent, plant community types (PCTs), TECs and vegetation integrity (site condition) within the subject land;
- Assess habitat suitability for threatened species that can be predicted by habitat surrogates (ecosystem credits) and for threatened species that cannot be predicted by habitat surrogates (species credit species);
- Identify potential prescribed biodiversity impacts on threatened species;
- Describe measures to avoid and minimise impacts on biodiversity values and prescribed biodiversity impacts during project planning;
- Describe impacts to biodiversity values and prescribed biodiversity impacts and the measures to mitigate and manage such impacts;
- Identify the thresholds for the assessment and offsetting of impacts, including:
    - Impact assessment of potential entities of serious and irreversible impacts (SAII);
    - Impacts for which an offset is required;

- Impacts for which no further assessment is required; and

- Describe the application of the no net loss standard, including the calculation of the offset requirement.

1.3. Project Description

1.3.1. Location

The project is located along Mamre Road, Kemps Creek, and comprises Lots 59-60 DP 259135 within the Western Sydney Employment Area (WSEA), approximately 50 km west of the Sydney Central Business District (CBD) and 12 km southeast of the Penrith CBD. It is also located within the Western Sydney Aerotropolis, approximately 6 km northeast of the Aerotropolis Core Precinct. The project is located within the Penrith Local Government Area and covers an area of approximately 33.35 ha. The project is located outside of the boundaries of the Western Sydney Growth Centres, and therefore is not biodiversity certified under the *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*.

The subject land falls within land mapped under the Draft Cumberland Plain Conservation Plan (CPCP) and has been identified for future biodiversity certification. However, as the CPCP is still in draft stages, it does not currently apply to the project.

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively. The current zoning of the study area and surrounds is shown in **Figure 3**.

1.3.2. Western Sydney Employment Area

The WSEA was established to supply businesses in the region with land for industry and employment. This can include transport, logistics, warehousing, and office space. The WSEA is located approximately 50 kilometres from the Sydney CBD, and provides businesses access to roads and utility services

The WSEA includes eleven precincts, and the subject land is located within the Mamre Road Precinct. The Mamre Road Precinct was rezoned in June 2020 and provides approximately 850 ha of industrial land which could accommodate about 5,200 construction jobs and 17,000 on-going jobs when fully developed. The rezoning of the precinct preserves around 95 ha of land for environmental conservation and open space and protects a site for a potential Western Sydney freight intermodal terminal.

The project has been designed in accordance with the objectives of the WSEA.

1.3.3. Draft Cumberland Plain Conservation Plan

The Draft CPCP is a conservation plan that is being developed for Western Sydney to help meet the future needs of the community while protecting threatened ecological communities and threatened flora and fauna species listed under the BC Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Draft CPCP is being developed to meet requirements for strategic biodiversity certification under the BC Act and strategic assessment under the EPBC Act. It will facilitate the biodiversity approvals required to deliver four nominated areas for development in Western Sydney and supporting major transport infrastructure. The subject site is located within the area identified as the Western Sydney Aerotropolis.

Overall, the Draft CPCP identifies the following categories of land within the nominated areas:

- Certified Urban Capable: development can occur without further biodiversity assessments, subject to development approval in accordance with precinct plans;
- Non-certified – Western Sydney Aerotropolis: 1 in 100 year flood affected land and other vegetated land within the Aerotropolis SEPP area;
- Non-certified – avoided for Biodiversity Purposes: land to be protected for its important environmental value and to be rezoned E2 Environmental Conservation;
- Non-certified – avoided for other purposes: land that has riparian corridors, steep slopes or other constraints such as flood risk and is to be rezoned E2 Environmental Conservation; and
- Excluded: land is excluded from the strategic certification as it is either already developed for urban use, is already subject to environmental protection or specific zoning, or is subject to a separate biodiversity approval process.

The subject site has largely been mapped as 'Certified – Urban Capable' with small corridor mapped as 'Non-certified – Avoided for Other Purposes'. The areas of Certified and Non-certified land correspond with the land zoning, with areas zoned IN1 mapped as Certified land and areas zone E2 mapped as Non-certified land. Under the Draft CPCP, development within Certified areas would be able to proceed without further biodiversity assessment provided the development is consistent with any precinct plans or master plans approved for the area.

Although the project is being undertaken prior to the implementation of the CPCP, it is noted that the future development of the majority of the subject land would be permissible under the CPCP.

1.3.4. Project Overview

The project comprises the development of the land and includes the following:

- Demolition of existing dwellings;
- Removal of all vegetation;
- Dewatering of existing dams;
- Bulk earthworks;
- Re-alignment of existing unnamed watercourse and riparian corridor;
- Reconstruction and revegetation of riparian corridor
- Construction of five warehouses and associated access roads; and
- Associated landscaping.

Additional details on the re-alignment of the E2 zone, comprising the unnamed watercourse and riparian corridor are provided in the Vegetation Management Plan (Cumberland Ecology 2021b) and Riparian Lands Assessment (Cumberland Ecology 2021a).

1.3.5. Identification of the Development Site Footprint

The layout of the project is shown in **Figure 4**. The development site footprint comprises the area of land directly impacted by the project including the existing buildings to be demolished, new facilities, watercourse and riparian zone and landscaping, and is referred to within this BDAR as the subject land. For the purposes of this assessment, the development site footprint comprises both the construction footprint and the operational footprint of the project. The overall development site footprint is hereafter referred to as the 'subject land', i.e. any mentioning of the development footprint or development site within this BDAR is synonymous with the subject land.

1.3.6. General Description of the Subject Land

1.3.6.1. Historical and Present Land Use

The subject land and wider subject land predominantly comprise farming properties primarily used for livestock grazing. Other land uses within the subject land comprise private roads, residences, dams and creeks.

Native vegetation occurring across the subject land and wider subject land varies from patches of open forest and woodland to exotic dominated grassland. Some areas within the farming properties have been historically subject to pasture improvement, with areas of heavy grazing dominated by exotic pasture species.

1.3.6.2. Topography, Geology and Soils

The subject land occurs in an undulating to hilly landscape with small areas of steeply sloping land. The topography across the site ranges between ~42 m to 84 m ADH. The subject land falls within the Luddenham and Blacktown soil landscapes. Luddenham soil landscapes are characterised by undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Blacktown soil landscapes are characterised by gently undulating rises on Wianamatta Group shales (DPIE 2021).

1.3.6.3. Hydrology

The subject land occurs within the Sydney water catchment and Hawkesbury-Nepean sub-catchment and contains one unnamed 2nd order watercourse (as per the Strahler System of ordering watercourses) in the E2 zone. Within the subject land, the watercourse currently shows no bank structure and consists primarily of a drainage depression with evidence of overland flow from the dam at the eastern side of the subject land downstream to the dam on the adjacent lot, west of the subject land.

The subject land contains three farm dams, one large dam in the E2 zone, a smaller dam to the south-west, as well as a medium sized dam in the north-west corner. The large farm dam within the E2 zone is filled from the watercourse, and the overflow runs into the western most dam.

The hydrology across the subject land is shown in **Figure 2**.

1.4. Information Sources

1.4.1. Databases

A number of databases were utilised during the preparation of this BDAR, including:

- Environment, Energy and Science (EES) BioNet Atlas (EES 2021a);
- EES Threatened Biodiversity Data Collection (EES 2021c);
- EES BioNet Vegetation Classification database (EES 2021b);
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Species Profile and Threat Database (DAWE 2021c);
- DAWE Protected Matters Search Tool (DAWE 2021b); and
- DAWE Directory of Important Wetlands in Australia (DAWE 2021a).

1.4.2. Literature

This BDAR has utilised the results and/or spatial data from the following documents:

- OEH (2013) Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207; and
- OEH (2016a): The Native Vegetation of the Sydney Metropolitan Area - VIS_ID 4489.

Other sources of information have been referenced throughout this BDAR.

1.4.3. Aerial Photography

The aerial imagery utilised in this BDAR is sourced from NearMap and is dated 26 January 2021 . Additional aerial images available on NearMap and SixMaps were also consulted.

1.5. Authorship and Personnel

This document has been prepared under the direction of Dr David Robertson (BAM Accredited Assessor No: BAAS17027). This document and associated field surveys and geographic information systems (GIS) mapping, were prepared with the assistance of additional personnel as outlined in **Table 1**. Notwithstanding the assistance of the additional personnel, the assessment presented within this document is Dr Robertson's.

Table 1 Personnel

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
David Robertson	Document review	Doctor of Philosophy. Ecology, University of Melbourne, 1986 Bachelor of Science (Honours) in Ecology, University of Melbourne, 1980	BAAS17027

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
		BAM Accredited Assessor Training. Muddy Boots, 2017	
Dr Gitanjali Katrak	Document review, document preparation	Doctor of Philosophy, Intertidal Wetland Ecology. Flinders University, 2011 Bachelor of Science (Honours) in Biological Sciences. La Trobe University, 2002 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS17064
Cecilia Eriksson Pinatacan	Document preparation	Bachelor of Science (Honours) in Marine Biology. University of Technology Sydney, 2008 Master of Science (Major in Marine Science and Management). University of Technology Sydney, 2013 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19052
Matthew Freeman	Document preparation, field surveys, credit calculations	Bachelor of Natural Science (Nature Conservation) University of Western Sydney, 2012 BAM Accredited Assessor Training. Muddy Boots, 2018	BAAS19019
Bryan Furchert	Document preparation, field surveys	Bachelor of Biodiversity and Conservation. Macquarie University, 2012 Diploma of Conservation and Land Management. TAFE NSW, 2008 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18095
Sally Dupont	Document preparation, field surveys	Bachelor of Science from Western Sydney University, 2012 Master of Research (Marine Biology) from Macquarie University, 2016 BAM Accredited Assessor Training. Muddy Boots, 2019	-
Michael Davis	GIS mapping	Bachelor of Biodiversity and Conservation. Macquarie University, 2016 BAM Accredited Assessor Training. Muddy Boots, 2017	-
Rebeca Violante	Field surveys	Diploma of Project Management. Australasia International School, Sydney, 2018. Bachelor of Science (Biology). Universidade Paulista, Brazil, 2015.	-

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
		Bachelor of Communication. Universidade Metodista de São Paulo, Brazil, 2008. BAM Accredited Assessor Training. Muddy Boots, 2019	
Baxter Punt	Field surveys	Bachelor of Biodiversity and Conservation, Macquarie University 2017 to present	-

2. Methodology

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area were reviewed, which includes:

- Survey data that is held in EES databases, including:
  - Threatened Biodiversity Data Collection (TBDC); and
  - BioNet Vegetation Classification.
- Existing vegetation mapping, being:
  - Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207 (OEH 2013)

This existing information was considered and included, where appropriate, in the survey design, vegetation mapping and reporting.

2.2. Landscape Features

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken on 25 June 2020 and 9 March 2021 sought to verify the following landscape features:

- Rivers, streams and estuaries;
- Important and local wetlands;
- Karsts, caves, crevices, cliffs and areas of geological significance; and
- NSW BioNet Landscapes.

No amendments were required to be made to any of these landscape features following field surveys.

2.3. Native Vegetation Survey

2.3.1. Vegetation Mapping

Previous broad-scale vegetation mapping conducted by the former Office of Environment and Heritage (OEH) (2013) encompasses the subject land and surrounds. Cumberland Ecology conducted additional vegetation surveys on 25 June 2020 and 9 March 2021 to revise and update the vegetation mapping. The vegetation within the subject land was ground-truthed to examine and verify the mapping of the condition and extent of the different plant communities. Mapping of plant communities within the subject land was undertaken by random meander surveys through patches of vegetation, noting key characteristics of areas in similar broad condition states such as similar tree cover, shrub cover, ground cover, weediness or combinations of these. Soils were also inspected.

Records of plant community boundaries were made using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs. The resultant information was synthesised using Geographic Information Systems (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject land.

2.3.2. Vegetation Integrity Assessment

Vegetation integrity assessments were undertaken in the subject land in accordance with the BAM. BAM requires the establishment of a 20 x 50 m plot with an internal 20 m x 20 m plot. The following data was collected within each of the plots:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m floristic plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20 m floristic plot;
- Cover of 'High Threat Exotic' weed species within a 20 m x 20 m floristic plot;
- Assessment of function attributes within a 20 x 50 m plot, including:
    - Count of number of large trees;
    - Tree stem size classes, measured as 'diameter at breast height (DBH)' over bark;
    - Regeneration based on the presence of living trees with stems <5 cm DBH;
    - The total length in metres of fallen logs over 10 cm in diameter;
- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 x 50 m plot.

A total of nine BAM plots were undertaken within the subject land and their location is shown in **Figure 5**. The location of plots have sought to capture the environmental variation of the PCTs identified within the subject land (see ***Section 4.2***). **Table 2** summarises the plot requirements based on the size and number of vegetation zones in the subject land. The vegetation in the subject land has been mapped as comprising four separate vegetation zones, and the minimum number of plots have been completed for each of these zones.

Table 2. Minimum Plot Survey Requirements

Vegetation Zone	PCT	Condition	Approximate Area (ha)	Minimum Number of Plots Required	Number of Plots Completed
1	850	Moderate	0.97	1	2
2	850	Low	0.19	1	1
3	1800	Moderate	0.31	1	1
4	1800	Low	0.68	1	1

2.4. Threatened Flora Species Survey

2.4.1. Habitat Constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit flora species.

2.4.2. Targeted Threatened Species Survey

Under Section 5.2.2 of the BAM 2020, species credit species can be excluded from further assessment, and thereby targeted surveys, if it is determined that none of the species-specific habitat constraints are present within the subject land. Furthermore, under Section 5.2.3 of the BAM, a candidate species credit species can be considered unlikely to occur on the subject land (or specific vegetation zones) if after carrying out a field assessment, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).

Targeted threatened flora surveys were undertaken for species credits species that were assessed as candidate species credit species for further assessment. **Table 3** provides a summary of the flora species credit species surveyed for within the subject land.

Table 3 Flora survey effort

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject Land	Survey Method
Acacia pubescens	Downy Wattle	Jan-Dec	9 March 2021 26 March 2021 30 March 2021	Random meander, plot survey
Cynanchum elegans	White-flowered Wax Plant	Jan - Dec	9 March 2021 26 March 2021 30 March 2021	Random meander, plot survey
Grevillea juniperina subsp. juniperina	-	Jan - Dec	9 March 2021 26 March 2021 30 March 2021	Random meander, plot survey
Marsdenia viridiflora subsp. viridiflora – endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool, and Penrith local government areas	Nov - Feb	9 March 2021 26 March 2021 30 March 2021	Random meander, plot survey

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject Land	Survey Method
Maundia triglochinoides	-	Nov - Mar	9 March 2021 26 March 2021 30 March 2021	Parallel traverses, plot survey
Persicaria elatior	Tall Knotweed	Dec - May	9 March 2021 26 March 2021 30 March 2021	Parallel traverses, plot survey
Pimelea spicata	Spiked Rice-flower	Jan - Dec	9 March 2021 26 March 2021 30 March 2021	Parallel traverses, plot survey
Thesium australe	Austral Toadflax	Nov - Feb	9 March 2021 26 March 2021 30 March 2021	Parallel traverses, plot survey

2.4.2.1. Parallel Traverses

Target Species: *Acacia pubescens, Cynanchum elegans, Grevillea juniperina* subsp. *juniperina, Marsdenia viridiflora* subsp. *viridiflora* – endangered population, *Maundia triglochinoides, Persicaria elatior, Pimelea spicata, Thesium australe.*

Targeted surveys were conducted using parallel field traverses in combination with a random meander in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016b). Targeted threatened flora surveys were undertaken by Bryan Furchert, Matt Freeman and Sally Dupont from Cumberland Ecology in March 2021.

Of the targeted species, two were surveyed outside of the recommended survey period including *Marsdenia viridiflora* subsp. *viridiflora* – endangered population and *Thesium australe*. *Marsdenia viridiflora* subsp. *viridiflora* – endangered population is readily identifiable to its genus, and no species within this genus were recorded within the subject land. *Thesium australe* is a conspicuous shrub and difficult to identify when understorey vegetation height exceeds 30cm. However the species, is parasitic and is typically found in association with *Themeda australis* (Kangaroo grass). Neither *Thesium australe* or *Themeda australis* were recorded within the subject land.

2.5. Threatened Fauna Species Survey

2.5.1. Habitat Constraints

Desktop assessments and field surveys within the subject land included assessment of habitat constraints and microhabitats for predicted species credit fauna species. This included desktop assessment of proximity of the subject land to features such as caves and waterways and field inspection of microhabitats including leaf litter, stick nests and hollowing-bearing trees. The field assessment was undertaken on the 9 March 2021 throughout the subject land.

2.5.2. Targeted Threatened Species Survey

Under Section 5.2.2 of the BAM 2020, species credit species can be excluded from further assessment, and thereby targeted surveys, if it is determined that none of the species-specific habitat constraints are present within the subject land. Furthermore, under Section 5.2.3 of the BAM, a candidate species credit species can be considered unlikely to occur on the subject land (or specific vegetation zones) if after carrying out a field assessment, the assessor determines that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones).

Targeted threatened fauna surveys were undertaken within the subject land for species credit species or breeding habitat for species/ecosystem credit species (hereafter referred to as dual credit species) that were assessed as candidate species credit species for further assessment. The survey design was guided by the following:

- NSW Government (2020): Biodiversity Assessment Method;
- DEC (NSW) (2004): Threatened Biodiversity Survey and Assessment, Guidelines for Development and Activities (Working Draft);
- Survey Guidelines for Australia's Threatened Mammals (DotE 2011);
- The Spot Assessment Technique: a tool for determining localised level of habitat use by Koalas (Phillips and Callaghan 2011);
- Department of Planning, Industry and Environment (DPIE) (2020): NSW Survey Guide for Threatened Frogs, a guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method; and
- NSW Government (OEH 2018): 'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method.

All surveys were undertaken during periods specified in the Threatened Biodiversity Data Collection (EES 2021c) for each species and according to relevant survey guidelines. **Table 4** provides a summary of the fauna species credit species surveyed for within the subject land, whilst detailed survey methods are described below.

The locations of the targeted fauna species surveys are shown in **Figure 6**.

Table 4 Fauna survey effort

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject Land	Survey Method
Litoria aurea	Green and Golden Bell Frog	Nov - Mar	25 March - 1 April 2021	Spotlighting, call playback, active searches
Meridolum corneovirens	Cumberland Plain Land Snail	Jan - Dec	25 March - 1 April 2021	Diurnal active search

Scientific Name	Common Name	Recommended Survey Period	Dates of Survey within Subject Land	Survey Method
Myotis macropus	Southern Myotis	Oct - Mar	25 March - 1 April 2021	Microchiropteran bat surveys - ultrasonic call detection, harp trapping
Petaurus norfolcensis	Squirrel Glider	Jan - Dec	25 March - 1 April 2021	Spotlighting, call playback, arboreal IR cameras
Phascolarctos cinereus	Koala	Jan - Dec	25 March - 1 April 2021	SAT surveys, diurnal active search, spotlighting
Pommerhelix duralensis	Dural Land Snail	Jan - Dec	25 March - 1 April 2021	Diurnal active search

2.5.2.1. Diurnal Active Search

Target Species: Cumberland Plain Land Snail, Dural Land Snail, Koala

An active search was undertaken within the subject land by an ecologist on the 26 and 30 March 2021. The survey method involved searches within 1 metre of native trees with bark and/or leaf litter present at the base. Searches included disturbance (via raking) of the bark and/or leaf litter to search for live snails, snail shells and Koala scats.

2.5.2.2. Microchiropteran Bat Surveys

Target Species: Southern Myotis

Survey Guidelines: 'Species credit' threatened bats and their habitats (NSW Government 2018).

Microbat surveys were undertaken in the subject land and study area using ultrasonic call detection. Two Songmeter (SM2) units were placed in proximity to areas of the most suitable microbat habitat and were left on-site to record microbat activity over seven consecutive nights from 25 March to 1 April 2021. Following completion of the surveys, all calls were analysed and species identified by Greg Ford of Balance Environmental.

Harp trapping was also used to directly capture microbats that forage in the subject land, as some threatened bat species that could potentially occur are difficult to identify using ultrasonic detectors. Trapping surveys for microchiropteran bats were undertaken over a period of three nights between 25 March and 1 April 2021 using harp traps. A total of two locations were surveyed. Harp traps were placed at locations identified in the habitat assessment as potential fly-ways for microchiropteran bat species, in close proximity to locations also surveyed by Songmeter units. Harp traps were deployed each night at dusk and checked and taken down each morning at dawn.

2.5.2.3. Koala SAT Surveys

Target Species: Koala

Surveys for Koala populations using the Spot Assessment Technique (SAT) were conducted throughout the subject land. Survey locations were chosen based on patches of vegetation within the subject land that contained Koala food trees. Once a central food tree was identified, a maximum of two-person minutes was spent searching for faecal pellets (scats) within a one metre radius of the base of the central tree and 29 surrounding trees. Tree trunks were searched for scratch marks and the canopy was observed for any Koalas present. In cases where 30 trees were not present only those available within a 25m radius of the central tree were surveyed. These surveys were completed at six sites throughout the subject land on the 26th and 30th March 2021.

2.5.2.4. Arboreal Infrared Cameras

Target Species: Squirrel Glider

Four baited infrared cameras were deployed throughout areas of the most suitable vegetation in the subject land between 25 March and 1 April 2021, over seven consecutive nights, to detect any fauna accessing the bait throughout the duration of the surveys. Feeders suitable for small mammals and birds were mounted on the side of trees and were filled with a mixture of honey and water, whilst jam was smeared on the trunk of the tree below the feeder, with an infrared camera aimed at the bait. Additionally, one IR camera was focused on a nest box, of which the entrance to the nest box was smeared with jam to attract fauna.

2.5.2.5. Nocturnal Surveys

Target Species: Squirrel Glider, Koala

Survey Guidelines: Threatened Biodiversity Survey and Assessment: Guidelines for Activities and Developments (DEC (NSW) 2004), Survey Guidelines for Australia's Threatened Mammals (DotE 2011).

Nocturnal surveys conducted in the subject land included spotlighting and call playback, and were undertaken over four nights between 25 and 31 March 2021. The surveys were undertaken as a random meander throughout the subject land, with particular focus on areas containing native vegetation.

Nocturnal spotlighting was undertaken via a random meander throughout the subject land using high power hand-held torches, focussing on treed areas and areas associated with habitat features. Spotlighting was undertaken over a 3 hour period on each of the survey nights.

Call playback was undertaken using a recording of the Squirrel Glider and Koala calls and involved broadcasting the calls for two minutes followed by a three minute listening period with the process repeated once (totalling ten minutes) and then actively searching the surrounding habitat for ten minutes.

During the nocturnal surveys, all observations of all birds, mammals, amphibians and reptiles were recorded.

2.5.2.6. Amphibian Surveys

Target Species: Green and Golden Bell Frog

Survey Guidelines: NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE 2020) and Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (DECC 2009).

Aural-visual and call playback surveys for amphibians was undertaken within the subject land. Call playback surveys were undertaken for five minutes for each species and involved the call being played for 30 seconds followed by a two minute listening period. This process was then repeated, and any frogs heard calling were recorded. An active search was then undertaken for a ten minute period. This was conducted for each species within suitable habitat. These surveys were undertaken in conjunction with the Nocturnal Surveys and took place over three nights between 25 and 31 March 2021.

2.5.2.7. Incidental Observations

Any incidental fauna species, particularly avifauna species, that were observed, heard calling, or otherwise detected based on tracks or signs, were recorded and listed in the total species list for the subject land. Furthermore, the locations of any specific habitat features, in particular hollow-bearing trees and raptor nests, incidentally sighted outside of the habitat assessment locations were also recorded.

2.6. Weather Conditions

Weather conditions during the field survey was appropriate for detection of target species credit species. A summary of weather conditions in the wider locality of the subject land (BOM Weather Station 067119 – Horsley Park, NSW) during the field survey is provided in **Table 5** (Bureau of Meteorology 2021).

Table 5 Weather conditions during field surveys

Date	Temperature Minimum (°C)	Temperature Maximum (°C)	Rainfall (mm)
09/03/2021	16.6	31.8	5.2
25/03/2021	14.4	27.5	0.0
26/03/2021	13.0	24.7	0.0
27/03/2021	13.8	27.1	0.0
28/03/2021	13.3	26.3	0.0
29/03/2021	13.6	26.0	0.0
30/03/2021	13.0	22.9	0.0
31/03/2021	11.4	24.5	0.0
01/04/2021	11.8	25.3	0.0

3. Landscape Features

3.1. Assessment Area

The subject land is approximately 32.19 ha in size and is shown in **Figure 2**. As the project is being assessed as a site-based project, the assessment area comprises the area of land within a 1,500 m buffer around the outer boundary of the subject land. The assessment area is approximately 1,176 ha in size and is shown in **Figure 2**.

3.2. Landscape Features

Landscape features identified within the subject land and assessment area are outlined below. The extent of these features within the subject land is shown in **Figure 1** and the extent within the assessment area is shown in **Figure 2**.

3.2.1. IBRA Bioregions and IBRA Subregions

The subject land and assessment area occurs within the Sydney Basin Bioregion and within the Cumberland Subregion.

3.2.2. Rivers, Streams and Estuaries

The subject land and assessment area occurs within the Hawkesbury Nepean catchment. One mapped 2nd order watercourses occur within the subject land, with numerous watercourses occurring within the assessment area. In addition to the Nepean River (sixth or higher order), several first, second and third order streams occur within the assessment area.

In accordance with Appendix 3 of the BAM, a riparian corridor of 10 m, 20 m, 30 m and 50 m either side of the waterway applies to 1st, 2nd, 3rd and ≥6th order streams, respectively. Previous consultation with the Natural Resources Assessment Regulator (NRAR) however, have confirmed that the 2nd order watercourse within the subject land does not meet the definition of waterfront land under the NSW *Water Management Act 2000* (WM Act) due to changes in landform from prior land uses.

3.2.3. Important and Local Wetlands

No important wetlands listed in the Directory of Important Wetlands in Australia are present in the subject land and/or assessment area. Numerous rural dams occur within the assessment area and on the subject land.

3.2.4. Habitat Connectivity

The subject land does not form part of a regional biodiversity corridor, flyway for migratory species, riparian buffer or estuary, or a local corridor identified by Penrith City Council.

The subject land connects to the riparian corridor of the South Creek via scattered paddock trees above a cleared understorey across adjacent properties. However that connectivity is limited due to the extensive clearing of vegetation caused by current and previous intense agricultural activity.

3.2.5. Karsts, Caves, Crevices, Cliffs and Areas of Geological Significance

No karsts, caves, crevices, cliffs or areas of geological significance have been identified within the assessment area based on searches of available aerial imagery from NearMap, or topographic data available from SixMaps.

3.2.6. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value (AOBVs) have been mapped within the subject land and/or assessment area.

3.2.7. BioNet NSW Landscapes

The subject land is located within the 'Cumberland Plain' BioNet NSW Landscape. The assessment area comprises a combination of the 'Cumberland Plain', 'Hawkesbury - Nepean Channels and Floodplains' and 'Sydney Basin Diatremes' landscapes.

3.2.8. Soil Hazard Features

No soil hazard features have been identified within the subject land. Within the assessment area, acid sulphate soil risk mapping occurs along the Nepean River.

3.2.9. Additional Features Required by SEARs

The SEARs do not require consideration of any additional features.

3.3. Native Vegetation Cover

The native vegetation cover was determined through the use of GIS. To map native vegetation cover within the subject land and assessment area, this assessment utilised the detailed vegetation mapping prepared by Cumberland Ecology in conjunction with broadscale mapping by OEH (2013). The native vegetation cover within the assessment area is shown in **Figure 2**. The assessment area is approximately 1,176 ha in size, of which approximately 134 ha comprises native vegetation cover, which represents 11% of the assessment area. Therefore, the native vegetation cover value is assigned to the cover class of >10–30%.

The remaining land within the assessment area comprises cleared land and exotic vegetation. No differences between the aerial photographs used in this assessment and the native vegetation cover shown in **Figure 2** have been identified.

4. Native Vegetation

4.1. Native Vegetation Extent

The subject land has been subject to detailed surveys by Cumberland Ecology for the purpose of this BDAR. The native vegetation extent within the subject land was determined through aerial photograph interpretation and field surveys. The native vegetation extent within the subject land is shown in **Figure 7**. It occupies approximately 2.21 ha, which represents approximately 7% of the subject land. The native vegetation extent within the subject land comprises planted and remnant native vegetation.

The remaining land within the subject land comprises exotic vegetation (24.28 ha), farm dams (1.71 ha) and cleared land (4.97 ha), including building pads, existing dwellings and access tracks, totalling an area of approximately 30.95 ha. In accordance with Section 4.1.2 of the BAM, these areas do not require further assessment, unless they provide habitat for threatened species or are proposed for restoration as part of an offset. Whilst areas within the re-aligned E2 zone are proposed to be revegetated, the revegetation works do not form part of any offset and therefore, these areas do not require further assessment. Furthermore, consultation with NRAR has confirmed that as the development is to be assessed through the SSD process, it is exempt from the need to obtain a Controlled Activity Approval from NRAR. Nevertheless, the watercourse within the E2 zone is not considered to be waterfront land as defined by the WM Act.

No differences between the aerial photographs used in this assessment and the native vegetation cover shown in **Figure 7** have been identified.

4.2. Plant Community Types

Identification of the PCTs occurring within the subject land was guided by the results of the surveys undertaken by Cumberland Ecology. The data collected during surveys of the subject land was analysed in conjunction with a review of the PCTs held within the BioNet Vegetation Classification database. In selecting PCTs, consideration was given to the following:

- Occurrence within the Cumberland IBRA subregion;
- Vegetation formation;
- Alignment with TECs;
- Landscape position; and
- Upper, mid and ground strata species (including cover and abundance).

The analysis determined that the native vegetation within the subject land and aligned with two PCTs held within the BioNet Vegetation Classification database. **Table 6** provides a summary of the PCTs identified within the subject land. The distribution of these PCTs within the subject land is shown in **Figure 8**. Detailed descriptions of these PCTs and the justification for PCT selection is provided in the sections below. Note that BAM plot data including cover and abundance for each species which has been used for the justification of PCTs is provided within the BAM-C.

Table 6 Plant community types within the subject land

PCT #	PCT Name	Subject Land (ha)
850	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	1.16
1800	Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	0.98

4.2.1. PCT 850: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 88%

TEC Status of PCT: Critically Endangered Ecological Community (CEEC)

TEC Status of onsite vegetation: CEEC

4.2.1.1. General Description

This community generally comprises an open woodland of Eucalyptus moluccana and Eucalyptus tereticornis Eucalyptus crebra also common. The community occupies higher elevations associated with the hills and rises south from Prospect.

4.2.1.2. Condition States

This PCT occurs as two condition classes within the subject land as detailed below.

i. Moderate Condition

This condition class includes a large patch of woodland in the south-east of the subject land and represents the occurrences of the community within the subject land in woodland formation.

The large patch is dominated by *Eucalyptus moluccana* (Grey Box), and several *Eucalyptus tereticornis* (Forest Red Gum) trees also occur. A native shrub layer is entirely absent from the community.

The ground layer is dominated by exotic grass species, with common to dominant species including *Nassella neesiana* (Chilean Needle Grass), *Setaria parviflora* (Pigeon Grass), and *Paspalum dilatatum* (Paspalum). Exotic forbs are common and include *Solanum sisymbriifolium* (Apple of Sodom), *Lepidium africanum*, *Conyza sumatrensis* (Tall Fleabane), and *Senecio madagascariensis* (Fireweed).

Some native grass species are sub-dominant, or common, and these species include *Chloris ventricosa* (Plump Windmill Grass), *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Sporobolus creber* (Slender Rat's Tail Grass), and *Bothriochloa decipiens* var. *decipiens* (Redleg Grass). Native forbs are uncommon and scattered in the ground layer and include *Brunoniella australis* (Blue Trumpet) and *Einadia polygonoides*.

An example of the moderate condition form of PCT 850 is shown in **Photograph 1**.

Photograph 1 Large patch of PCT 850 Moderate Condition within the subject land

ii. Low Condition

The occurrences of PCT 850 Low Condition comprise scattered trees only and consist of predominately *Eucalyptus moluccana* trees, and several *Eucalyptus tereticornis* trees are also present, along with a single *Eucalyptus amplifolia* subsp. *amplifolia* in the west of the subject land. In each instance trees occur over a ground layer nearly exclusively dominated by exotic grass species such as the grasses *Paspalum dilatatum*, *Cenchrus clandestinus*, and *Chloris gayana*.

An example of low condition form of PCT 850 is shown in **Photograph 2**.

Photograph 2 Scattered trees that form PCT 850 Low Condition within the subject land

4.2.1.3. Justification of PCT Selection

Cumberland Plain Woodland naturally occurs within the locality and the vegetation on the subject land closely conforms to the features identified in the final determination for the community, especially in the areas of the subject land. Floristic characters used to distinguish these areas were the prevalence of *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis*, the generally sparse understorey of locally indigenous shrubs, and occurrence of diagnostic native grasses and forbs. Furthermore, the edaphic features of the subject land are characteristic of those identified in the final determination, specifically the occurrence of clays derived from shales.

4.2.1.4. Alignment with Threatened Ecological Communities

PCT 850 is aligned with the TEC Cumberland Plain Woodland which is listed as a CEEC under the BC Act and EPBC Act. The occurrences of the low condition form of the PCT do not meet the criteria for the listing under the EPBC Act which states condition thresholds which require the ground layer to be dominated by perennial native species and/or patch size to be larger than isolated trees.

4.2.2. PCT 1800: Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Vegetation Formation: Forested Wetlands

Vegetation Class: Coastal Floodplain Wetlands

Percent Cleared Value: 60%

TEC Status of PCT: Endangered Ecological Community (EEC)

TEC Status of onsite vegetation: EEC

4.2.2.1. General Description

Cumberland Swamp Oak Riparian Forest is generally found on the riverflats of the Cumberland Plain in western Sydney and in the Hunter Valley. The distinguishing feature is the prominent stands of swamp oak (Casuarina glauca) found along or near streams. This community generally features an open grassy and herbaceous understorey, as is typical of riverflat forests.

4.2.2.2. Condition States

Swamp oak open forest on riverflats of the Cumberland Plain and Hunter valley occurs in two condition states within the subject land as detailed in the subsequent sections.

i. Moderate Condition - EEC

This community occurs within the floodplains of drainage lines and dams within the subject land. The canopy is dominated by *Casuarina glauca* (Swamp Oak), which also occurs in the sub-canopy and shrub layers. The community occurs as a large patch to the north of the dam, as a small patch on the north-west bank of the dam, and as a small patch on the drainage line draining the dam. The small patches have a sparse ground cover of predominately exotic species along with the native rush *Juncus usitatus*.

The large patch of the community has a shrub layer dominated by juvenile *Casuarina glauca* individuals. The exotic species *Dovyalis caffra* (Kei Apple) and *Lycium ferocissimum* also occur.

The ground layer is dominated by the native grass *Microlaena stipoides* var. *stipoides*. Other native species present include the grasses *Chloris ventricosa* and *Sporobolus creber,* and the forbs *Alternanthera nana, Cyperus gracilis,* and *Oxalis perennans*.

The exotic grass *Nassella neesiana* is sub-dominant in the ground layer. Other common exotic species include the grass *Setaria parviflora* and the forbs *Conyza sumatrensis*, *Solanum sisymbriifolium*, and *Modiola caroliniana* (Red-flowered Mallow).

An example of the moderate condition form of PCT 1800 is shown in **Photograph 3.**

Photograph 3 Moderate form of PCT 1800 at lower elevations within the subject land

ii. Low Condition – Non EEC

This community consists of patches of *Casuarina glauca* trees in areas not associated with flood plains within the site. Two patches in the east of the property occur at an elevation that would place them above the floodplain of the dam in the subject land – these occurrences have likely spread upslope from distribution of seed from individuals further downslope where they would have historically occurred in association with floodplains. The trees at this location are colonising areas which would likely have been cleared paddocks dominated by exotic grass species. The patch in the west is likely derived from planted trees or placement of soil with *Casuarina glauca* seed at this location from elsewhere within the subject land or locality.

The patch in the west has a ground layer consisting of exotic weed species only and bare earth. The occurrences in the west have a ground layer dominated by the exotic grass *Nassella neesiana.* Other exotic grass species such as *Paspalum dilatatum* and *Setaria parviflora* are common, as are exotic forbs such as *Solanum sisymbriifolium*, *Senecio madagascariensis,* and *Conyza bonariensis* (Flax-leaved Fleabane).

The ground layer is sub-dominated by the native grass *Microlaena stipoides* var. *stipoides* in some areas. Other native species with a more scattered distribution include the grasses *Austrostipa verticillata* (Slender Bamboo Grass) and *Bothriochloa decipiens* var. *decipiens* and forbs including *Brunoniella australis* and *Oxalis perennans.*

An example of the low condition form of PCT 1800 is shown in **Photograph 4.**

Photograph 4 Low form of PCT 1800 at higher elevations within the subject land

4.2.2.3. Justification of PCT Selection

PCT 1800 is the PCT for the vegetation community occurring along river-flats in the Cumberland Plain which is dominated by *Casuarina glauca*. Although a former creek running through the site has been modified by dams within and above the site, the lower elevation occurrences of *Casuarina glauca* within the site are likely associated with the historical floodplain of the former creek. PCT 1800 is also considered to be a pioneering community that is re-establishing following clearing which is consistent with the current and former land uses of the site.

4.2.2.4. Alignment with Threatened Ecological Communities

Moderate Condition – EEC class of the PCT meets the definition of the TEC Swamp Oak Floodplain Forest which is listed as an EEC under BC Act and the EPBC Act. The patches do not meet the criteria for listing under the EPBC Act which has condition thresholds detailing required patch sizes.

Low Condition – Non EEC zone of the PCT does not conform to the listed community under the BC Act or the EPBC Act as it does not occur within a floodplain.

4.3. Other Vegetation Types

4.3.1. Planted Native Vegetation

BC Act Status: Not listed

EPBC Act Status: Not listed

4.3.1.1. General Description

This community is associated with dwellings and structures within the subject land and consists of garden plantings of native trees and shrubs. The majority of trees are of the species *Grevillea robusta* (Silky Oak), and two individuals of *Corymbia maculata* (Spotted Gum) are planted near a dwelling in the centre of the subject land. Shrub species include *Callistemon viminalis* (Weeping Bottlebrush) and *Leptospermum petersonii* (Lemon-scented Tea-tree). All planted vegetation occurs either over exotic grasses or garden beds.

An example of this community is shown in **Photograph 5.**

Photograph 5 Planted Native vegetation within the subject land

4.3.1.2. Justification of PCT selection

An assessment against the decision-making key in Appendix D of the BAM was undertaken and it was determined that Planted Native Vegetation did not need to be assigned to a PCT. **Table 7** provides an assessment against the decision-making key.

Table 7 Assessment against the decision-making key

Decision-Making Key	Response
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?	No – scattered planted native species do not form a mosaic with remnant native vegetation
2. Is the planted native vegetation: a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?	No – native species have not been planted for the purposes of environmental rehabilitation or restoration, or to replace or regenerate a PCT or threatened species population or habitat.
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: a. a species recovery project b. Saving our Species project c. other types of government funded restoration project 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 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) f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?	No – planted species are not listed as threatened flora species and have not been planted to provide habitat for threatened species.
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?	No – planted native vegetation was not undertaken for the purposes of revegetation, rehabilitation or restoration.
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 agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?	Yes – native species have been planted for aesthetic purposes in gardens and paddocks. Native vegetation has been considered for use by threatened species (The use of Chapters 4 and 5 of the BAM are not required to be applied).

Decision-Making Key	Response
6. Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)?	N/A

4.3.2. Exotic Vegetation

Areas around dwellings and structures within the subject land have plantings of a variety of exotic species, either as trees in lawns or as trees, shrubs, and herbaceous species in garden beds. Exotic trees include *Jacaranda mimosifolia* (Jacaranda) and *Syagrus romanzoffiana* (Cocos Palm), shrubs include *Strelitzia reginae* (Bird of Paradise) and *Plumbago auriculata* (Blue Plumbago), and herbs include *Clivia miniata* (Natal Lily) and the climber *Jasminum polyanthum* (Many-flowered Jasmine).

Extensive areas of the site consist of grasslands highly dominated by exotic species. These includes paddocks and lawns. Lawn areas are dominated by species such as *Cenchrus clandestinus*.

Paddocks are generally dominated or co-dominated by *Cenchrus clandestinus*, *Nassella neesiana*, *Paspalum dilatatum*, and/or *Setaria parviflora.* Exotic forbs are common throughout these areas and include *Conyza bonariensis*, *Senecio madagascariensis,* and *Cyclospermum leptophyllum* (Slender Celery).

Native grasses and forbs are present in paddocks however in all BAM plots surveyed comprised less than 10% of cover. Species include the grasses *Sporobolus creber* and *Bothriochloa decipiens* var. *decipiens*.

An example of this community is shown in **Photographs 6**.

Photograph 6 Exotic vegetation within the subject land

4.3.3. Dams

The subject land contains three farm dams. The largest dam contains little to no fringing or emergent aquatic/semi-aquatic vegetation and is surrounded predominantly by exotic vegetation. The two smaller farm dams do contain fringing and emergent vegetation including *Typha orientalis* (Broadleaf Cumbungi) and *Cycnogeton microtuberosum* which are both considered coloniser species in artificial wetlands. This community does not conform to any known PCT or community listed under the BC Act or EPBC Act.

The example of dams within the subject land are shown in **Photographs 7** and **8**.

Photograph 7 Large farm dam within the subject land

Photograph 8 Smaller farm dam within the subject land

4.3.4. Cleared Land

The subject land contains some limited areas completely devoid of vegetation along the northern portion of the subject land. Additionally, areas containing driveways and other structures are considered as cleared land.

4.4. Threatened Ecological Communities

Two PCTs within the subject land have been assessed as conforming to a TEC listed under the BC Act and/or EPBC Act. **Table 8** summarises the PCTs identified within the subject land that conform to TECs as listed under the BC Act and the EPBC Act respectively and their distribution is shown in **Figure 9**.

Table 8 Threatened ecological communities within the subject land

TEC	BC Act Status of subject land occurrence	EPBC Act Status of subject land occurrence	Associated PCT	Approximate Area within subject land (ha)
Cumberland Plain Woodland in the Sydney Basin Bioregion	CEEC	CEEC	PCT 850 (moderate condition): Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	0.97
	CEEC	Not listed	PCT 850 (low condition): Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	0.19
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC	EEC	PCT 1800 (moderate condition): Swamp oak open forest on riverflats of the Cumberland Plain and Hunter valley	0.31
	Not listed	Not listed	PCT 1800 (low condition): Swamp oak open forest on riverflats of the Cumberland Plain and Hunter valley	0.68

**In some cases total may not equal the appropriate total number due to rounding*

4.5. Vegetation Integrity Assessment

The native vegetation identified within the subject land was assigned to a vegetation zone based on PCTs and broad condition states. Patch sizes were subsequently assigned for each vegetation zone. The extent of vegetation zones and patch size classes within the subject land are shown in **Figure 10**.

Each vegetation zone was assessed using survey plots/transects (see ***Section 2.3.2***) to determine the vegetation integrity score. Composition, Structure and Function attributes were assessed against benchmark data as per the BioNet Vegetation Classification. Plot/transect data utilised to determine the vegetation integrity score is provided in **Appendix A**. Field data sheets and electronic copies of raw data are provided separately to this document as attachments within the BAM-C.

Vegetation zones, patch sizes and vegetation integrity scores for the subject land are summarised in **Table 9**.

Table 9 Vegetation zones within the subject land

Vegetation Zone	PCT#	PCT Name	Condition Name	Area (ha)	Patch Size Class	Presence of Hollow-bearing Trees	Vegetation Integrity Score
1	850	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Moderate	0.97	<5	Yes	34.4 (Composition: 22.6 Structure: 49 Function: 36.7)
2	850	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	Low	0.19	<5	Yes	12.3 (Composition: 8.2 Structure: 22 Function: 10.3)
3	1800	Swamp oak open forest on riverflats of the Cumberland Plain and Hunter valley	Moderate	0.31	<5	No	50.5 (Composition: 41.9 Structure: 76.3 Function: 40.3)
4	1800	Swamp oak open forest on riverflats of the Cumberland Plain and Hunter valley	Low	0.68	<5	No	38.6 (Composition: 37.2 Structure: 44.8 Function: 34.4)

5. Threatened Species

5.1. Identifying Threatened Species for Assessment

The BAMC generates a list of threatened species requiring assessment utilising a number of variables. The following criteria have been utilised to predict the threatened species requiring further assessment:

- IBRA subregion: Cumberland;
- Associated PCTs: 850 and 1800;
- Percent native vegetation cover in the assessment area: 11%;
- Patch size: <5 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAMC generated a list of 29 ecosystem credit species and 35 species credit species. These totals include 13 dual credit species which are considered as ecosystem credit species for their foraging habitat and as species credit species for their breeding habitat. Ecosystem credit species and species credit species are assessed further in ***Section 5.2*** and ***Section 5.3***, respectively.

5.2. Ecosystem Credit Species

Table 10 lists the predicted ecosystem credit species for the vegetation zone within the subject land and the associated PCT. The highest sensitivity class of these species is "High Sensitivity to Potential Gain", which has subsequently been utilised by the BAM Calculator for the calculation of ecosystem credits.

Table 10 Ecosystem credit species requiring further assessment

Scientific Name	Common Name	Habitat Constraint	Sensitivity to Gain Class	Predicted PCTs and Planted Native Vegetation with Suitable Habitat	Retained in Assessment?	Justification if Not Retained
Anthochaera phrygia	Regent Honeyeater (Foraging)	-	High	850, 1800	Yes	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	-	Moderate	850, 1800	Yes	-
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	-	Moderate	850	Yes	-
Chthonicola sagittata	Speckled Warbler	-	High	850, 1800	Yes	-
Circus assimilis	Spotted Harrier	-	Moderate	850	Yes	-
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	-	High	850, 1800	Yes	-
Daphoenositta chrysoptera	Varied Sittella	-	Moderate	850, 1800	Yes	-
Dasyurus maculatus	Spotted-tailed Quoll	-	High	850, 1800	Yes	-
Glossopsitta pusilla	Little Lorikeet	-	High	850, 1800	Yes	-
Grantiella picta	Painted Honeyeater	-	Moderate	850, 1800	Yes	-
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	-	High	850, 1800	Yes	-
Hieraaetus morphnoides	Little Eagle (Foraging)	-	Moderate	850, 1800	Yes	-

Scientific Name	Common Name	Habitat Constraint	Sensitivity to Gain Class	Predicted PCTs and Planted Native Vegetation with Suitable Habitat	Retained in Assessment?	Justification if Not Retained
Ixobrychus flavicollis	Black Bittern	-	Moderate	1800	Yes	-
Lathamus discolor	Swift Parrot (Foraging)	-	Moderate	850, 1800	Yes	-
Lophoictinia isura	Square-tailed Kite (Foraging)	-	Moderate	850, 1800	Yes	-
Melanodryas cucullata cucullatta	Hooded Robin (south-eastern form)	-	Moderate	850, 1800	Yes	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	-	High	850, 1800	Yes	-
Miniopterus australis	Little Bent-winged Bat (Foraging)	-	High	850, 1800	Yes	-
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	-	High	850, 1800	Yes	-
Neophema pulchella	Turquoise Parrot	-	High	850, 1800	Yes	-
Ninox strenua	Powerful Owl (Foraging)	-	High	850, 1800	Yes	-
Pandion cristatus	Eastern Osprey (Foraging)	-	Moderate	1800	Yes	-
Petroica boodang	Scarlet Robin	-	Moderate	850, 1800	Yes	-
Petroica phoenicea	Flame Robin	-	Moderate	850, 1800	Yes	-
Phascolarctos cinereus	Koala (Foraging)	-	High	850, 1800	Yes	-

Scientific Name	Common Name	Habitat Constraint	Sensitivity to Gain Class	Predicted PCTs and Planted Native Vegetation with Suitable Habitat	Retained in Assessment?	Justification if Not Retained
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	-	High	850, 1800	Yes	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	High	850, 1800	Yes	-
Stagonopleura guttata	Diamond Firetail	-	Moderate	850, 1800	Yes	-
Tyto novaehollandiae	Masked Owl (Foraging)	-	High	850, 1800	Yes	-

5.3. Species Credit Species

5.3.1. Assessment of Habitat Constraints and Microhabitats

Table 11 lists the predicted species credit species for the vegetation zones within the subject land, and whether they have been retained within the assessment following consideration of habitat constraints, geographic limitations, vagrancy and quality of microhabitats. Under Section 5.2.3 of the BAM, further species credit species can be excluded from further assessment if an assessment of habitat constraints and microhabitats determines that the habitat within the subject land is substantially degraded such that the species credit species is unlikely to occur.

Habitat assessments of the site were undertaken as described in ***Section 2.4.1*** and ***Section 2.5.1***. The habitat assessments focussed on habitat features relevant to species credit species predicted to occur. This included determining the presence/absence of the habitat constraints identified for the predicted threatened species and the condition of these habitat constraints and other microhabitats.

The Regent Honeyeater and Swift Parrot have been excluded from further assessment following checks of Mapped Important Areas that no important habitat occurs within the subject land for either species. Breeding habitat for both species is limited to specific areas that are not associated with, or in the vicinity of, the subject land, therefore since the species credit species component for both species is associated with breeding habitat only, both the Regent Honeyeater and Swift Parrot were excluded from further assessment and assessed as ecosystem credit species for foraging habitat only.

The habitat assessment surveys conducted focussed on determining if habitat for any potential species credit species (or relevant breeding component for dual credit species) was either not present or substantially degraded such that the species is unlikely to utilise the subject land or a specific vegetation zone in accordance with the requirements of Section 5.2.3 of the BAM.

A total of 14 flora species credit species and 21 fauna species credit species (including dual credit species) have been predicted for the subject land. Of these, eight flora species and six fauna species have been retained for further assessment and have been targeted during surveys outlined in ***Section 2.4*** and ***Section 2.5***, respectively.

Table 11 Species credit species requiring further assessment

Scientific Name	Common Name	Sensitivity to Gain Class	Retained in Assessment?	Justification if Not Retained
Flora				
Acacia pubescens	Downy Wattle	High	Yes	-
Caladenia tessellata	Thick Lip Spider Orchid	Moderate	No	Microhabitats too degraded to support species. The species is currently considered to be extinct in the Sydney Area and it is speculated all former habitat within Sydney has been cleared – microhabitats across Sydney are therefore considered too degraded to support the species (NSW Scientific Committee 2008).
Cynanchum elegans	White-flowered Wax Plant	High	Yes	-
Deyeuxia appressa	Deyeuxia appressa	High	No	Microhabitats too degraded to support species. Microhabitats are considered too degraded across the entire Sydney area as the species is now considered extinct and has only ever been recorded twice prior to 1942.
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	Moderate	Yes	-
Gyrostemon thesioides	Gyrostemon thesioides	High	No	Microhabitats too degraded. Former riparian area within site has been highly modified to extent it only exists currently as a dam and an overflow soak. Hillside habitat within the subject land consists of shale-derived clay soils, not fine sandy soils associated with the species.
Marsdenia viridiflora subsp. viridiflora – endangered population	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown,	Moderate	Yes	-

Scientific Name	Common Name	Sensitivity to Gain Class	Retained in Assessment?	Justification if Not Retained
	Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool, and Penrith local government areas			
Maundia triglochinoides	Maundia triglochinoides	High	Yes	-
Persicaria elatior	Tall Knotweed	High	Yes	-
Pilularia novae-hollandiae	Austral Pillwort	High	No	Microhabitats too degraded too support species. Former riparian area within site has been highly modified to extent it only exists currently as a dam and an overflow soak. The species is currently only known form two populations.
Pimelea spicata	Spiked Rice-flower	High	Yes	-
Pomaderris brunnea	Brown Pomaderris	High	No	Microhabitats too degraded. The shrub layer is mostly absent across the entire subject land in woodland patches and consists mostly of exotic species. Former riparian area within site has been highly modified to extent it only exists currently as a dam and an overflow soak. Furthermore, species is a conspicuous shrub and no *Pomaderris* species were located during threatened species searches – flowers are not required to identify *Pomaderris* spp. to genus level.
Pultenaea pedunculata	Matted Bush-pea	High	No	Microhabitats too degraded. The shrub layer is mostly absent across the entire subject land in woodland patches and consists mostly of exotic species.
Thesium australe	Austral Toadflax	Moderate	Yes	-

Scientific Name	Common Name	Sensitivity to Gain Class	Retained in Assessment?	Justification if Not Retained
Fauna				
Anthochaera phrygia	Regent Honeyeater (Breeding) *	High	No	Habitat constraint absent from the subject land - i.e. subject land does not lie within Mapped Important Areas
Burhinus grallarius	Bush Stone-curlew	High	No	Microhabitats within the subject land are degraded, such that the species is unlikely to use the habitat. Subject land occurs in a highly cleared agricultural landscape and the majority of the potentially suitable habitat has undergone disturbance. Furthermore, none of the previous studies undertaken for the project to date have recorded the species and no records occur within a 10km radius in the past 30 years according to BioNet.
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	High	No	Habitat constraint absent from the subject land - i.e. subject land does not contain Eucalypt tree species with hollows greater than 9cm diameter
Cercartetus nanus	Eastern Pygmy-possum	High	No	Microhabitats within the subject land are degraded, such that the species is unlikely to use the habitat. Subject land occurs in a highly cleared agricultural landscape and the majority of the potentially suitable habitat has undergone disturbance. Furthermore, none of the previous studies undertaken for the project to date have recorded the species and no records occur within a 10km radius in the past 30 years according to BioNet.
Chalinolobus dwyeri	Large-eared Pied Bat	Very High	No	Habitat constraint absent from the subject land - i.e. subject land is not within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old tunnels or mines.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	High	No	Habitat constraint absent from the subject land – i.e. no large stick nest within tree canopy of live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.

Scientific Name	Common Name	Sensitivity to Gain Class	Retained in Assessment?	Justification if Not Retained
Hieraaetus morphnoides	Little Eagle (Breeding)	Moderate	No	Habitat constraint absent from the subject land – i.e. no large stick nest within tree canopy of live or dead large old trees.
Lathamus discolor	Swift Parrot (Breeding)	Moderate	No	Habitat constraint absent from the subject land - i.e. subject land does not lie within Mapped Important Areas
Litoria aurea	Green and Golden Bell Frog	High	Yes	-
Lophoictinia isura	Square-tailed Kite	Moderate	No	Habitat constraint absent from the subject land – i.e. no large stick nest in the top half of the tree canopy.
Meridolum corneovirens	Cumberland Plain Land Snail	High	Yes	-
Miniopterus australis	Little Bent-winged Bat (Breeding)	Very High	No	Habitat constraint absent from the subject land - i.e. subject land does not contain caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Very High	No	Habitat constraint absent from the subject land - i.e. subject land does not contain caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding
Myotis macropus	Southern Myotis	High	Yes	-
Ninox strenua	Powerful Owl (Breeding)	High	No	Habitat constraint absent from the subject land – i.e. subject land does not contain trees with hollows greater than 20cm.
Pandion cristatus	Eastern Osprey (Breeding)	Moderate	No	Habitat absent from the subject land – i.e. subject land does not contain stick-nests in living and/or dead trees (>15m) or artificial structures within 100m of a floodplain for nesting)
Petaurus norfolcensis	Squirrel Glider	High	Yes	-

Scientific Name	Common Name	Sensitivity to Gain Class	Retained in Assessment?	Justification if Not Retained
Phascolarctos cinereus	Koala (Breeding) *	High	Yes	-
Pommerhelix duralensis	Dural Land Snail	High	Yes	-
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding) *	High	No	Habitat constraints constraint absent from the subject land - i.e. no breeding camps are present within or adjacent to the subject land
Tyto novaehollandiae	Masked Owl (Breeding)	High	No	Habitat constraint absent from the subject land – i.e. subject land does not contain trees with hollows greater than 20cm.

5.3.2. Presence of Candidate Species

5.3.2.1. Surveys

Targeted surveys for the candidate species credit species for further assessment undertaken within the subject land are detailed further in ***Section 2.4*** and ***Section 2.5***.

5.3.2.2. Expert Report

This assessment has not utilised any expert reports.

5.3.2.3. Candidate Species Occurrence

Table 12 lists the species credit species that have been assessed as occurring within the subject land. None of the other candidate species credit species, or their habitat component (e.g. large stick nests) were detected within the subject land during targeted surveys.

Table 12 Species credit species assessed as present within the subject land

Scientific Name	Common Name	Biodiversity Risk Weighting	Presence
Myotis macropus	Southern Myotis	2	Present. Species identified within the subject land using ultrasonic bat detection devices.

5.3.2.4. Non-Candidate Species

Calls for the Large Bent-winged Bat (*Miniopterus orianae oceanensis*) were also recorded across the two ultrasonic bat detectors. The Large Bent-wing Bat is a dual species credit species, being a species credit species for breeding habitat (caves, tunnel, mine, culvert or other structure known or suspected to be used for breeding) and an ecosystem credit species for foraging. As the habitat constraints for breeding are absent from the subject land, the species has been assessed as an ecosystem credit species for foraging habitat only.

5.3.3. Extent of Habitat

The Southern Myotis was recorded foraging within the subject land. The vegetation within the subject land is located within 200 m of a waterbody with pools/ stretches 3m or wider including several farm dams. Furthermore, some hollow-bearing trees have been recorded within the subject land.

As such, the habitat within the subject land is considered to comprise both breeding and foraging habitat. In accordance with NSW Government (2018), the species polygon boundary aligns with the PCTs within the subject land which are associated with the species in the Threatened Biodiversity Data Collection. The following vegetation zones are considered to comprise foraging habitat for the Southern Myotis and constitute the species polygon for the species (total of 2.15 ha):

- Zone 1 –850_Moderate: 0.97 ha and vegetation integrity score of 34.4; and
- Zone 2 – 850_Low: 0.16 ha and vegetation integrity score of 12.3.

- Zone 3 – 1800_Moderate: 0.31 ha and vegetation integrity score of 50.5.
- Zone 4 – 1800_Low: 0.68 ha and vegetation integrity score of 38.6.

The species polygon for the Southern Myotis is shown in **Figure 11**.

6. Prescribed Impacts

Prescribed impacts are identified in Clause 6.1 of the *Biodiversity Conservation Regulation 2017* (BC Regulation). Prescribed impacts are those that are additional to the clearing of native vegetation and associated habitat. These include:

- Development on the habitat of threatened species or ecological communities associated with:
  - karst, caves, crevices, cliffs, rock outcrops and other geological features of significance;
  - human-made structures; and
  - non-native vegetation;
- Development on areas connecting threatened species habitat, such as movement corridors;
- Development on water quality, water bodies and hydrological processes that sustain threatened species and TECs (including from subsidence or upsidence from underground mining) ;
- Wind turbine strikes on protected animals; and
- Vehicle strikes on threatened species or on animals that are part of a TEC.

An assessment of the relevance of these prescribed impacts to the project is provided in **Table 13**. The location of prescribed impacts is shown in **Figure 12**.

Table 13 Identification of prescribed impacts

Prescribed Impact	Relevance to the Project
Karst, caves, crevices, cliffs, rocks and other geological features of significance	Not relevant. Features are not present within the subject land.
Human-made structures	Relevant. The project includes the staged demolition of a number of existing buildings within the subject land. This includes existing residential dwellings and sheds within the subject land. The residential dwellings are well maintained however potential habitat is available for microchiropteran bats. Direct impacts to human made structures will occur during the construction phase of the project.
Non-native vegetation	Relevant. Non-native vegetation occurring within the subject land comprises areas of managed lawns, garden plants and agricultural grasslands. This vegetation may provide some low-value habitat for native fauna species, including threatened birds and bats, on occasion. Impacts to non-native vegetation would occur during the construction phase of the project and result in a long-term impact.
Habitat connectivity	Relevant. The subject land forms part of a patch of vegetation that largely exists as canopy trees above a highly modified understorey. Due to the historical clearing of the site, most of the subject land has low function as a corridor or connecting link. Nevertheless, the woody vegetation within the subject land and adjoining vegetation within the adjacent Lot to the east forms stepping-stone habitat between larger

Prescribed Impact	Relevance to the Project
	patches of vegetation to the north-east within the assessment area. Additionally, the three dams and 2nd order watercourse within the subject land provide connectivity for the movement of aquatic species.
Waterbodies, water quality and hydrological processes	Relevant. The subject land contains a mapped 2nd Order stream and three farm dams. These waterbodies may provide habitat for aquatic flora and fauna species and the project will result in altered hydrological characteristics of the subject land. Additional details on the proposed modifications to the watercourse and associated riparian land are provided in the Riparian Lands Assessment (Cumberland Ecology 2021a) and Vegetation Management Plan (Cumberland Ecology 2021b).
Wind farm developments	Not relevant. The project does not comprise a wind farm development
Vehicle strikes	Relevant. The proposed development will result in the creation of access roads and private driveways, thereby increasing future vehicle traffic within the subject land and thereby increase the potential of vehicle strike.

7. Avoid and Minimise Impacts

This chapter includes demonstration of efforts to avoid and minimise impacts on biodiversity values identified within the subject land, which includes assessment of direct, indirect and prescribed impacts. Any mentioning of the development footprint within this chapter is synonymous with the subject land.

7.1. Avoid and Minimise Direct and Indirect Impacts on Native Vegetation and Habitat

Under the BAM, measures taken to avoid and minimise impacts on biodiversity values from the development need to be documented. As described in previous chapters, the subject land comprised 2.21 ha of native vegetation in the form of PCT 850, PCT 1800 and planted native vegetation, which represents 7% of the site. The remainder of the subject land (93%) comprises land that has previously been modified for residential and agricultural purposes, and now constitutes a mix of planted native vegetation, exotic vegetation, dams and cleared land.

Most of the subject land has previously been rezoned as IN1 General Industrial under the Western Sydney Employment Area, with a small strip zoned as E2 Environmental Conservation in association with an existing watercourse. Furthermore, under the draft Cumberland Plain Conservation Plan, the land zoned as IN1 has also been identified as proposed 'Certified – Urban Capable' land, with the E2 land proposed as 'Non-certified' land. Hence, most of the site has been identified as suitable for development.

When considering the requirements associated with the IN1 zoning and the extent of earthworks required for the site to be compatible with an industrial development, in combination with the scattered nature of the native vegetation within the subject land, opportunities to avoid impacts to biodiversity values are limited. As a result, all native vegetation within the site is proposed to be removed as part of the project.

Although several iterations of the design of the development footprint have been produced, specific site constraints in relation to the existing landform had to be considered when finalising the development footprint location and design. Extensive consultation with DPIE and NRAR has also been undertaken in order to prepare the final development footprint configuration. As a result, the existing E2 zone will be realigned and revegetated as part of the project, to create a biodiversity corridor that runs through the subject land and links habitats on either side of the site. The area that is covered by the existing configuration of the E2 zone is currently treeless as part of existing paddocks comprising exotic dominated grasslands.

The 'do nothing' option for the project would maintain current vegetation cover on site but would not enable redevelopment to achieve the zone objectives for the IN1 zone. Considering the surrounding land use, the existing patches of native vegetation may be subject to further degradation over time. Furthermore, under a 'do nothing' option, the E2 zone would likely remain in its current state; treeless with vegetation limited to exotic dominated grasslands and would not serve as a suitable biodiversity corridor.

A partial development of the subject land to avoid and minimise the impacts on biodiversity is also not a feasible option for the project, as the project would not be financially viable with a reduced development layout.

Despite the information listed above, minimisation of impacts can still be achieved to a degree by the modification of the location and design of the project. Details of the minimisation measures adopted for the

project are outlined in **Sections 7.1.1** and **7.2.1-7.2.5.** A summary of avoidance and minimising measures considered for this project is provided in **Table 14**.

7.1.1. Project Location and Design

In determining the location and design of the final development footprint, the project has sought to minimise impacts on native vegetation and habitat by:

- Realignment and revegetation of the exiting E2 zone, to incorporate a biodiversity corridor as part of the development that will connect habitat on either side of the subject land and continue to provide fauna linkage through the site.
- Preparation and implementation of a site-specific erosion and sediment control plan to mitigate potential impacts associated with erosion, sedimentation and pollution.
- Preparation and implementation of a Vegetation Management Plan, which will primarily focus on the re-aligned E2 zone and the reconstruction of a riparian corridor with native vegetation that is broadly representative of the original plant community, as well as the proposed bioretention basins.
- Preparation and implementation of a site-specific Dam Dewatering Plan, to minimise impacts on biodiversity associated with the decommissioning of the dams that occur in the subject land.
- Implementation of a suite of mitigation measures as part of the project (**Chapter 9**), to minimise the impacts on biodiversity, including:
    - Weed management;
    - Pre-clearance surveys and clearance supervision; and
    - Staging of clearing.

7.2. Avoid and Minimise Prescribed Impacts

7.2.1. Human-made Structure

The project includes the staged demolition of a number of existing buildings within the subject land. This includes existing residential dwellings and sheds within the subject land, which may provide some habitat for microchiropteran bats.

Due to the extent of earthworks required to make the site compatible with an industrial development, impacts to human-made structures are not able to be avoided as part of the project. However, potential impacts on biodiversity resulting from the demolition of the human-made structures will be minimised through the implementation of a suite of mitigation measures (see **Chapter 9**), including pre-clearance surveys and clearance supervision by a qualified ecologist.

7.2.2. Non-native Vegetation

Areas of non-native vegetation within the subject land are predominantly in the form of managed lawns, garden plants and exotic dominated paddocks. Although the non-native vegetation may provide some habitat

value for native fauna in terms of shelter and foraging resources, these areas are unlikely to be favoured over adjoining forest and woodland habitats outside of the subject land.

Nevertheless, due to the extent of earthworks required to make the site compatible with an industrial development, impacts to the areas of non-native vegetation are not able to be avoided as part of the project.

7.2.3. Habitat Connectivity

Due to the historical clearing of the site, the habitat connectivity in the subject land is limited to the patches of woodland and forest that function as stepping-stone habitat connecting larger patches of vegetation beyond the subject land. Additionally, the three dams and 2nd order watercourse within the subject land provide connectivity for the movement of aquatic species.

As explained in previous sections, when considering the requirements associated with the IN1 zoning and the extent of earthworks required for the site to be compatible with an industrial development, in combination with the scattered nature of the native vegetation in the subject land, opportunities to avoid impacts native vegetation are limited. Hence, impacts on habitat connectivity are not able to be avoided.

Nevertheless, minimisation measures for the project include the re-alignment and revegetation of the E2 zone, which will function as a riparian corridor. This corridor will ensure habitat connectivity can continue to be facilitated through the subject land, providing linkage between areas on either side of the site.

7.2.4. Waterbodies, Water Quality and Hydrological Processes

The project requires the re-alignment of the 2nd order watercourse within the subject land as well as the decommissioning of three farm dams. Although impacts to the 2nd order watercourse cannot be avoided, due to the required extent of the development, the realignment of the 2nd order watercourse will improve the quality and function of the watercourse. Furthermore, relevant measures to minimise impacts on biodiversity for the project include the reconstruction and revegetation of the riparian corridor surrounding the realigned watercourse.

The decommissioning of the three farm dams is also not able to be avoided, due to the extent of earthworks required for the site to be compatible with an industrial development. To minimise impacts on biodiversity associated with the decommissioning of the dams, a Dam Dewatering Plan will be prepared and implemented.

7.2.5. Vehicle Strikes

The project will result in the creation of access roads and private driveways within the subject land. As such, there is likely to be an increase in vehicle traffic within the subject land and thereby increasing the potential of vehicle strikes. The implementation of traffic control measures, primarily speed limits along access roads and driveways will reduce the potential for vehicle strikes on native fauna species.

Table 14 Summary table of options considered for the project to avoid and minimise impacts on biodiversity

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
Implementation of a suite of mitigation measures	Yes	To minimise the impacts on biodiversity, and TEC's in particular, a suite of mitigation measures will be implemented such as the delineation of clearing areas, Erosion Sedimentation and Pollution control, timing of vegetation clearance, pre-clearance surveys, clearance supervision, weed management, Dam Dewatering Plan and Vegetation Management Plan.	Pre and post construction and during operation phase	Proponent and consultant team	Minimise impacts on biodiversity
Design amendments to various elements of the project design	Yes	Several design amendments have been implemented for the project to avoid and minimise impacts on biodiversity. This includes the re-alignment of the E2 zone and construction of a biodiversity corridor (including the creation of a suitable watercourse with defined bed and bank structure as well as the reconstruction of a riparian corridor), and the construction of bio-retention basins.	During design and approval	Proponent and consultant team	Avoid and minimise direct and indirect impacts on TECs and fauna habitat.
Partial development of the study area to avoid/minimise impacts on biodiversity and achieve greater tree retention	No	The option to only undertake a partial development of the site, to avoid clearing and retain both PCT 850 and 1800, is not in line with the objectives of the IN1 zone and would not be financially viable. Furthermore, the potential for future development of the site once bio-certified	-	-	-

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
		under the CPCP would allow for removal of all native vegetation.			
'Do-nothing' option to avoid all impacts on biodiversity	No	The 'do nothing' option for the project would maintain current vegetation cover on site but would not enable redevelopment to achieve the zone objectives for the IN1 zone. Considering the surrounding land use, the existing patches of native vegetation may be subject to further degradation over time. Furthermore, under a 'do nothing' option, the E2 zone would likely remain in its current state; treeless with vegetation limited to exotic dominated grasslands and would not serve as a suitable biodiversity corridor.	-	-	-
Consideration of alternative sites and layouts for the development within the study area	Yes	The sites selected for development were determined in order to meet the objectives of the land zoning whilst establishing a suitable biodiversity corridor within the subject land. The proposed development requires the re-alignment of the E2 zone which, is currently degraded and provides negligible biodiversity values. Warehouse layouts and potential locations for the E2 zone were considered and the final location selected has	During design and approval	Proponent and consultant team	Re-alignment of the E2 zone and establishment of a suitable biodiversity corridor that provides habitat connectivity across the subject land.

Action	Adopted (Yes/No/In part)	Justification	Timing (if adopted)	Responsibility (if adopted)	Outcome (if adopted)
		consideration to both biodiversity values and the development yield associated with the IN1 zone.			

8. Assessment of Impacts

8.1. Direct Impacts

The primary and direct impact resulting from the project is the loss of native vegetation and associated habitat within the subject land. **Tables 15-16** identify the proposed impacts to vegetation and threatened species habitat within the subject land.

Table 15 Extent of direct impacts to vegetation within the subject land

Vegetation Zone	PCT #	PCT Name	BC Act Status	Area in the Subject Land (ha)
Zone 1	850_Moderate	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	CEEC	0.97
Zone 2	850_Low	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	CEEC	0.19
Zone 3	1800-Moderate	Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	EEC	0.31
Zone 4	1800_Low	Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	-	0.68
-	-	Planted Native Vegetation	-	0.06
-	-	Exotic Vegetation	-	24.28
-	-	Dams	-	1.71
-	-	Cleared Land	-	4.97

Table 16 Extent of threatened species impacts (species polygon) within the subject land

Scientific Name	Common Name	BC Act Status	Area (ha)
Myotis macropus	Southern Myotis	V	2.12

8.2. Change in Vegetation Integrity Score

Table 17 details the change in vegetation integrity score for each vegetation zone and management zone. The direct impacts of the project only involve one management zone, being the total clearing of vegetation within the subject land.

Table 17 Change in vegetation integrity score for vegetation zones

Vegetation Zone	PCT #	Management Zone	Area (ha)	Current VI Score	Future VI Score	Change in VI Score
Zone 1	850_Moderate	Complete Clearance	0.97	34.4	0	-34.4
Zone 2	850_Low	Complete Clearance	0.19	12.3	0	-12.3
Zone 3	1800_Moderate	Complete Clearance	0.31	50.5	0	-50.5

Vegetation Zone	PCT #	Management Zone	Area (ha)	Current VI Score	Future VI Score	Change in VI Score
Zone 4	1800_Low	Complete Clearance	0.68	38.6	0	-38.6

8.3. Indirect Impacts

Table 18 outlines the indirect impacts to native vegetation and habitat. Due to the existing highly modified nature of the vegetation both within and adjacent to the subject land, the indirect impacts of the project are not considered to be significant.

Table 18 Indirect impacts of the project

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Inadvertent impacts on adjacent habitat or vegetation	Construction activities may result in inadvertent impacts on retained vegetation, such as increase sedimentation.	Retained vegetation on Lots adjacent to the subject land.	Short term (during construction)	Cumberland Plain Woodland and Swamp Oak Floodplain Forest	Reduced condition of the TEC occurring within Lots adjacent to the subject land.
Reduced viability of adjacent habitat due to edge effects	Modification of vegetation extent within the subject land may increase edge effects.	Retained vegetation on Lots adjacent to the subject land.	Potential long-term	Cumberland Plain Woodland and Swamp Oak Floodplain Forest	Reduced condition of the TEC occurring within Lots adjacent to the subject land.
Reduced viability of adjacent habitat due to noise, dust or light spill	The construction activities associated with the project are likely to increase the noise, dust and light above current levels within the subject land.	Retained vegetation on Lots adjacent to the subject land.	Short term (during construction)	Ecosystem credit species	Short term disruption of fauna habitat usage during construction.
Transport of weeds and pathogens from the site to adjacent vegetation	A number of high threat exotic weeds are known to occur within the subject land and may be inadvertently spread to vegetation adjacent to the subject land.	Retained vegetation on Lots adjacent to the subject land.	Potential long-term	Cumberland Plain Woodland and Swamp Oak Floodplain Forest	Reduced condition of the TEC occurring within Lots adjacent to the subject land.
Loss of breeding habitats	Hollow-bearing trees will be removed during construction activities.	Vegetation within Zone 1.	Long-term	Hollow-dependent ecosystem credit species (e.g. microchiropteran bats)	Reduction in available breeding habitat of hollow-dependent fauna and increased competition for hollows within vegetation on Lots adjacent to the subject land.

8.4. Prescribed Impacts

The project has been assessed as resulting in four prescribed impacts (see ***Chapter 6***). An assessment of these prescribed impacts is provided below.

8.4.1. Human-made Structures

8.4.1.1. Nature

The project requires the staged demolition of a number of existing buildings within the subject land. This includes existing residential dwellings and sheds within the subject land.

8.4.1.2. Extent

The proposed development will impact a total of 4.97 ha of cleared land including buildings and hard stand areas.

8.4.1.3. Duration

Direct impacts to human-made structures would occur during the construction and operational phase of the project. The removal of the human-made structures is considered to be a long-term impact.

8.4.1.4. Threatened Entities Affected

Due to the existing ongoing use of the human-made structures, it is unlikely that threatened entities will be affected by the demolition of these structures. The habitat provided by human-made structures may provide roosting habitat for ecosystem species, such as microchiropteran bats.

8.4.1.5. Consequences

The project will result in a very minor reduction in human-made structures by 4.97 ha. The reduction of this small area of structures is not considered to significantly impact upon threatened entities.

8.4.2. Non-native Vegetation

8.4.2.1. Nature

The project requires the removal of all non-native vegetation within the subject land. Non-native vegetation includes areas of planted exotic vegetation and grasslands as displayed in **Figure 12**.

8.4.2.2. Extent

The proposed development will clear a total of 24.28 ha of non-native vegetation.

8.4.2.3. Duration

Impacts to non-native vegetation would occur during the construction phase of the project. The removal of the non-native vegetation is a long-term impact.

8.4.2.4. Threatened Entities Affected

The habitat provided by non-native vegetation may provide some foraging habitat for ecosystem species, such as microchiropteran bats and birds. The non-native vegetation is not considered suitable breeding/nest habitat due to lack of hollows.

8.4.2.5. Consequences

The project will result in a reduction in non-native vegetation by 24.28 ha. The reduction of this small area of habitat is not considered to significantly impact upon the potentially affected threatened entities as the non-native vegetation comprises marginal to sub-optimal habitat and other areas of suitable habitat, in the form of both native and non-native vegetation, will remain immediately adjacent the subject land and within the assessment area.

8.4.3. Habitat Connectivity

8.4.3.1. Nature

The subject land contains some scattered patches of remnant native vegetation that exist as canopy trees above a highly modified understorey. The vegetation within the subject land connects to a larger patch of native vegetation to the north-east of the subject land. The vegetation proposed to be removed from within the subject land will result in a small area along the edge of a larger patch to be removed, reducing the overall extent of the remaining patch of vegetation. It is unlikely that threatened species that potentially utilise this patch will be significantly affected by the removal of a small area of native vegetation within the subject land.

8.4.3.2. Extent

Habitat connectivity will be marginally reduced by the removal of 2.21 ha of vegetation. The vegetation to be removed within the subject land is part of a small patch, of which will result in fragmentation of habitat. One small area consists of the edge of a large patch and will not result in further fragmentation of habitat in the locality.

8.4.3.3. Duration

Direct impacts to habitat connectivity would occur during the construction and operational phase of the project. The reduction of habitat connectivity is a long-term impact. However, proposed revegetation within the re-aligned E2 zone across the eastern portion of the subject land as well as landscaping as part of the project will restore habitat connectivity across the subject land.

8.4.3.4. Threatened Entities Affected

The habitat provided by native vegetation may provide foraging habitat for ecosystem species, such as the Grey-headed Flying-fox, microchiropteran bats and birds.

8.4.3.5. Consequences

The project will result in the reduction in native vegetation considered as stepping-stone habitat by 2.21 ha and will remove three dams located within the subject land. Although the clearing of the subject land will result in a reduction of habitat, the reduction of this small area of habitat is not considered to significantly impact the movement of mobile fauna species as better-quality habitat is located in the assessment area. For example, the Grey-headed Flying-fox forages opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources (NSW Scientific Committee 2004). Woodland birds and microchiropteran bats are also highly mobile and are unlikely to restricted in movement due by the removal of the small areas of native vegetation from within the subject land. Aquatic species are more likely to traverse the landscape through the 2nd Order watercourse, rather than overland between the

dams. Although the watercourse is highly degraded it will be realigned and enhanced as part of the proposed development. Furthermore, revegetation to establish a suitable riparian corridor along the watercourse will improve habitat connectivity across the subject land. Therefore, it is considered unlikely that native fauna would be solely reliant on the habitat within the subject land for movement between different areas of habitat.

8.4.4. Waterbodies, Water Quality and Hydrological Processes

8.4.4.1. Nature

The project requires the re-alignment of the 2nd order watercourse within the subject land as well as the decommissioning of three farm dams. The realignment of the 2nd order watercourse will improve the quality and function of the watercourse. In its current state it lacks a defined bed and bank structure and is not considered to meet the definition of waterfront land under the NSW *Water Management Act 2000*. The removal of vegetation throughout the subject land will result in alterations to drainage pathways and will alter flows as a result. The construction of the roads and other hardstand areas have the potential to the alter surface hydrological conditions and may result in erosion and sedimentation due to construction activities and vegetation removal. The placement of drainage outlets also has the potential to change flows and create scour risk in high-flow areas at discharge points.

8.4.4.2. Extent

The entire section of the 2nd order watercourse within the subject land will be realigned as part of the project. There will be no removal of watercourses within the subject land. Furthermore, the three farm dams will be decommissioned.

When the subject land is developed, there will be increased hard surfaces and potential for more runoff downstream. This will be managed to protect downstream areas and mitigation measures will include the re-establishment of a riparian corridor with species characteristic of locally occurring vegetation communities, plus new storm water management measures.

8.4.4.3. Duration

Changes will be permanent if the development is constructed.

8.4.4.4. Threatened Entities Affected

The habitat provided by existing waterbodies provides foraging habitat for the Southern Myotis.

8.4.4.5. Consequences

The project will result in alterations to the existing 2nd order watercourse and the removal of three farm dams within the subject land, resulting in altered hydrological conditions. However, potential changes to hydrology are not considered to be significant and hydrological outcomes within the subject land will improve in the long term through the design and establishment of a new watercourse with a defined bed and bank structure.

The future change from vegetated areas to hardstand areas can potentially increase the velocity of flows as well as impacting the water quality. The project has been designed to account for this by directing flows towards bioretention basins for treatment of water prior to further discharge into the mapped 2nd order

watercourse. The re-aligned watercourse as well as the proposed drainage outlets will be designed with adequate scour protection measures to slow the flow and reduce erosion and scour.

The threatened entity most likely to use the waterbodies within the subject land is the Southern Myotis (*Myotis macropus*). This species typically requires waterbodies of 3 m in diameter within 200 m of vegetation containing hollow-bearing trees or other suitable roosting habitat features. The 2nd Order watercourse within the subject land is ephemeral and would be unlikely to offer consistent foraging habitat for the species. However the three farm dams, within the subject land would be more likely to provide consistent foraging habitat for the species.

The farm dams represent relatively lower quality foraging habitat for the Southern Myotis considering the availability of habitat around Prospect Reservoir, approximately 8km to the north-east. Furthermore, numerous farm dams will persist within the areas surrounding subject land. The impacts to Southern Myotis foraging habitat will be temporary in nature with the construction of large retention basins and enhancement of the 2nd order watercourse and associated riparian vegetation within the subject land.

The project has been designed using water sensitive urban design to maintain or improve quality of discharge into creeks and drainage lines. Erosion and sediment control measures will be implemented throughout the construction periods in order to minimise potential impacts to the existing hydrological processes of the subject land. Subsequently, the potential changes to hydrology are therefore not considered to be significant and hydrological outcomes within the subject land may improve in the long term.

9. Mitigation Measures

A range of mitigation measures have been developed for the project to mitigate the impacts to native vegetation and habitat that are unable to be avoided. These include a range of measures to be undertaken before and during construction to limit the impact of the project. Each mitigation measure is discussed in detail below, and a summary is provided in **Table 17**.

9.1. Mitigation of Impacts to Native Vegetation and Habitat

9.1.1. Delineation of Clearing Areas

To avoid unnecessary removal or damage to the TEC's or other retained vegetation, the clearing area will be clearly demarcated with temporary fencing and signed, where appropriate, to ensure no vegetation beyond these boundaries will be inadvertently cleared during the construction process.

No machinery should be parked on areas beyond the temporary fencing and no access should be allowed during construction. Ancillary facilities such as stockpile sites, site compounds and construction zones should not be located beyond the limits of clearing. Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of any no-access areas.

9.1.2. Erosion, Sedimentation and Pollution Control

The project may result in erosion and transport of sediments as a result of soil disturbance during construction. In order to prevent this impact, construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures:

- Installation of sediment control fences;
- Covering soil stockpiles; and
- Avoiding soil disturbance prior to heavy rainfall.

To reduce sedimentation on the construction site, erosion control measures should be implemented. This includes minimising the amount of exposed soils on the site at any given time. All soil stockpiles should be adequately covered when not in use to prevent erosion from heavy rainfall. Sediment fences should be established around the perimeter of the development area to prevent the impacts of sedimentation on the adjoining vegetation. During development, precautions should be taken to ensure that no pollution, such as petrochemical substances or water containing suspended solids, escapes the construction site. Pollution traps and efficient removal of pollution to an off-site location are required to help to minimise pollution impacts.

9.1.3. Vegetation Clearance Timing

The clearance of woodland shall only occur outside of Winter (June, July and August) when fauna (particularly microchiropteran bats) are most likely to self-relocate during the clearing.

9.1.4. Pre-clearance Surveys

In order to avoid impacts to fauna species during construction, pre-clearing surveys should be undertaken by a suitably qualified ecologist. Pre-clearing surveys will be undertaken ahead of clearing, to limit fauna injury and mortality and to identify habitat features to be relocated. Pre-clearance surveys will be conducted by

suitably qualified ecologists and all fauna found during these surveys will be encouraged to move on or relocated by the ecologists in areas of similar habitat nearby that will not be impacted.

Pre-clearing surveys will include:

- Demarcation of key habitat features as hollow-bearing trees, fallen logs and bush rock;
- Checking trees for the presence of bird nests and arboreal mammals, such as possums, and bats;
- Animals found to be occupying trees and habitat will be safely removed and relocated into nearby wooded habitat.
- Identification and nomination of hollow-bearing trees or hollows to be salvaged and relocated to adjacent retained vegetation for reuse as fauna habitat; and
- Provision of a report following the completion of a pre-clearing survey, detailing the location and type of each habitat feature, and a record of all fauna species encountered.

9.1.5. Staging of Clearing

The clearing will be conducted using a two-stage clearing process as follows:

Stage 1: Clearing will commence following the identification of potential habitat features by a qualified ecologist. Hollow-bearing trees marked during pre-clearing will not be cleared during the first stage; however, all vegetation around these trees will be cleared to enable isolation of the feature. Other habitat features, such as hollow-bearing logs, can be removed during Stage 1 only if done under supervision by a qualified ecologist. Identified hollow-bearing trees will be left at a minimum overnight after Stage 1 clearing to allow resident fauna to voluntarily move from the area.

Stage 2: After hollow-bearing trees have been left overnight, the trees will be cleared using the following protocols:

- Trees marked as containing hollows will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on;
- Use a bulldozer or excavator to start pushing the tree over. Move the bulldozer over the roots and continue gently pushing the tree over;
- Remove branches with hollows and sections of trunk and set aside for immediate transfer to a storage area for placement within retained vegetation; and
- All hollows will be investigated by an ecologist for the presence of fauna following felling of the tree.

The felled habitat tree will be left overnight to allow any remaining fauna time to leave the hollows and move on.

The two-stage clearing process enables fauna a chance to self-relocate upon nightfall, when foraging typically occurs.

Provisions will be made to protect any native fauna during clearing activities by the following means:

- All staff working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;
- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations; and
- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal by an appropriately trained/qualified person (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanised).

At the end of clearing works (or relevant stages thereof), a clearing supervision report will be provided detailing the total number and species of individuals recorded and details of their release and/or treatment in case of injured fauna.

9.1.6. Habitat Salvage

Any timber that would be suitable to create habitat within the riparian corridor or instream habitat should be salvaged during clearing. These should be identified by the ecologist during clearance supervision and should be separated from remaining material that could be mulched on site. Timber suitable for salvage should include larger logs and branches that are unlikely to decompose between clearing and revegetation. Salvaged features should be stockpiled away from areas impacted by earthworks to ensure the features do not become mixed with soil.

9.1.7. Weed Management

In order to minimise the spread of weeds throughout the subject land, appropriate weed control activities will be undertaken in accordance with all state and regional weed management plans.

The subject land lies within the South East Local Land Services Area and is subject to the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (Local Land Services 2019) and management of Weeds of National Significance.

The NSW *Biosecurity Act 2015* and regulations provide specific legal requirements for state level priority weeds and high-risk activities, as provided in the Appendices of the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (Local Land Services 2019). In order to comply with the objectives of the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022, it is recommended the following measures be implemented as part of a management plan for the subject land. An indicative list of State-priority and other high threat environmental weeds that should be prioritised for control is provided in **Appendix F**.

i. Prevention

Appropriate construction site hygiene measures will be implemented to prevent entry of new weeds to the area such as the use of wash bays.

ii. Eradication

Initial weed management will be carried out over the development site with a focus on targeting species listed under Appendices 1 and 2 of the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (Local Land Services 2019).

Initial weed treatment will include eliminating woody species and targeting large dominant infestations of exotic herbs. In particular, High Threat Exotic weed species occurring within the subject land will be managed in order to prevent further spread. Prior to any vegetation clearance, High Threat Exotic weeds should be demarcated in order for these to be disposed of separately from native material.

iii. Containment

Follow-up monitoring and maintenance should be undertaken in areas of the development site that have received past primary weeding treatments in the following months, to contain any re-emergence of weed species.

iv. Minimisation

Minimisation of weed species that cannot be effectively controlled on the site, such as exotic grasses, will be prevented from further spread through construction and operational phase site hygiene procedures.

9.1.8. Dam Dewatering Plan

A Dam Dewatering Plan is to be prepared that includes:

- A review of existing data for the subject land and wider locality, including previous records of threatened aquatic species;
- Details of a proposed aquatic survey methodology;
- Identification of a relocation site for species encountered during dewatering activities; and
- Survey and reporting requirements.

An approved Dam Dewatering Plan will need to be in place prior to the commencement of dewatering works.

9.1.9. Vegetation Management Plan

A Vegetation Management Plan (VMP) is to be prepared for the subject land. The VMP will primarily focus on the re-aligned E2 zone and the reconstruction of a riparian corridor with native vegetation that is broadly representative of the original plant community, as well as the proposed bioretention basins. The VMP will provide guidelines for the revegetation, regeneration and management of vegetation within the subject land and will also detail requirements for fauna habitat restoration and weed management practices.

Table 19 Summary of mitigation measures for impacts to native vegetation and habitat

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
Delineation of clearing limits	Clearing limits marked either by high visibility tape on trees of metal/wooden pickets, fencing or an equivalent boundary marker. Disturbance, including stockpiling, restricted to clearing limits.	Construction	Once	Contractor	High	Unnecessary damage to trees to be retained.
Erosion, sedimentation and pollution control	Construction activities will be undertaken in accordance with "The Blue Book" (Landcom 2004). These include implementation of the following measures: Installation of sediment control fences; Covering soil stockpiles; and Avoiding soil disturbance prior to heavy rainfall	Construction	Throughout construction period	Contractor	High	Sedimentation into retained and adjoining vegetation.
Vegetation Clearance Timing	The clearance of trees and vegetation would only occur outside of winter (June, July and August).	Construction	Prior to clearing	Contractor	Moderate	Increased and unnecessary mortality of native fauna.
Pre-clearance survey	Pre-clearance surveys will be conducted in all areas of vegetation that are required to be cleared. Pre-clearing surveys will be undertaken within one week of clearing. Habitat features will be marked during the pre-clearing survey.	Construction	Once	Contractor	Moderate	Increased and unnecessary mortality of native fauna.
Staging of clearing	Vegetation clearing will be conducted using a two-stage clearing process. Animals disturbed or dislodged during the clearance but not injured will be assisted to move to adjacent bushland or other specified locations	Construction	Once	Contractor	High	Increased and unnecessary mortality of native fauna.

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
	If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized)					
Weed management	Appropriate weed control activities will be undertaken in accordance with the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2017).	Construction	Prior to construction, following vegetation clearing	Contractor	High	Spread of weeds throughout the study area and surrounding land.
Dam Dewatering Plan	Prior to dam dewatering activities a Dam Dewatering Plan prepared that includes a strategy for dewatering of the three dams within the subject land and a relocation site for any fauna captured	Construction	Once	Contractor	Moderate	Increased and unnecessary mortality of native fauna.
Vegetation Management Plan	A VMP is to be prepared prior to the commencement of construction which will provide guidelines for the revegetation, regeneration and management of vegetation within the subject land.	Pre/post construction	Throughout construction and operation periods	Contractor	High	Loss of habitat

9.2. Mitigation Measures for Prescribed Impacts

The following mitigation measures, described in ***Section 8.3***, are relevant to the prescribed impacts of the project:

- Delineation of clearing limits;
- Sedimentation control measures;
- Pre-clearance survey;
- Clearing supervision and protocols;
- Habitat Salvage;
- Dam Dewatering Plan; and
- Vegetation Management Plan.

No additional mitigation measures are proposed for prescribed impacts.

9.3. Adaptive Management for Uncertain Impacts

The project is considered unlikely to result in any uncertain impacts that require adaptive management.

9.4. Use of Biodiversity Credits to Mitigate or Offset Indirect or Prescribed Impacts

The project does not propose to use additional biodiversity credits to mitigate or offset indirect or prescribed impacts as the impacts are not considered to be significant when the proposed management strategies for these impacts are taken into consideration.

10. Thresholds for Assessment

10.1. Introduction

The assessment thresholds that must be considered include the following:

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

The following sections outline these assessment thresholds and their relevance to the project.

10.2. Impacts on Serious and Irreversible Impact Entities

One SAII entity, Cumberland Plain Woodland CEEC, will be impacted by the project. The location of the Cumberland Plain Woodland in relation to the development footprint is shown in **Figure 13**. Approximately 1.16 ha of Cumberland Plain Woodland will be removed within the subject land. Section 9.1 of the BAM requires the provision of additional information regarding SAII entities that are TECs. The additional information is required to assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact.

The additional information requirements, and the responses to each requirement, are shown in **Table 18**.

Table 20 Information in relation to the additional impact assessment provision for TECs at risk of an SAII, for Cumberland Plain Woodland CEEC in the subject land

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
1	The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII (or reference to where these have been addressed in the relevant section of the BDAR)	Avoidance of impacts to biodiversity values is addressed in detail in **Chapter 7** of this BDAR. When considering the requirements associated with the IN1 zoning and the extent of earthworks required for the site to be compatible with an industrial development, in combination with the scattered nature of the native vegetation within the subject land, opportunities to avoid impacts to biodiversity values are limited. As a result, all areas of Cumberland Plain Woodland CEEC in the site are proposed to be removed as part of the project.
2	The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including:	
(a)	Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	The current total geographic extent of Cumberland Plain Woodland varies depending on the source interrogated. The current extent of Cumberland Plain Woodland in the TBDC is described as only less than 9% of the original extent remaining and does not include a conclusive total area for the community. BioNet Classification System (EES 2021b) estimates the current area of occupancy of the community based on the two PCTs (849 and 850) conforming to CPW with available data as approximately 11,200 ha of the original 'Pre-European Extent' published on the website of 71,200 ha. The information on the website varies slightly in percent cleared

BAM Section 9.1.1 Additional Impact Assessment Provisions Criteria	Response
	estimates as the average cleared amount of PCTs 849 and 850 published is listed as 90.5%. This differs with the percent cleared when calculated using the current extent versus the Pre-European Extent which would suggest that over 15% of the community still remains – a difference of over 3,500 ha. it is noted however, that BioNet documents two further PCTs as potentially conforming to the BC Act listing of Cumberland Plain Woodland. These PCTs however, do not contain published total areas for the communities. Therefore, the BioNet total current and Pre-European Extent areas of the community can not be accurately estimated and is likely a vast under-estimation. Cumberland Plain Woodland is also associated with a targeted recovery plan for the Cumberland Plain that was prepared by the Department of Environment, Climate Change and Water (DECCW – now DPIE) (2011). This document is the currently accepted standard for the retention and recovery of TECs in the Cumberland Plain. Table 2 of the recovery plan displays an estimated current total of Cumberland Plain Woodland of 24,530 ha however, it is reported that a small portion of this total does not meet the listing criteria for the CEEC under the BC Act. The same table also estimates the 'Pre-1750 (ha)' total of the community at 125,449 ha being a reduction in area to current levels of approximately 20%. Of the current total area, the recovery plan reports approximately 967 ha identified as occurring within reserves. The Final Determination for Cumberland Plain Woodland (NSW Scientific Committee 2011) identifies that the TEC is restricted in

BAM Section 9.1.1 Additional Impact Assessment Provisions Criteria	Response
	geographic distribution to the Sydney Basin Bioregion and was estimated to have an extant area of approximately 11,054 ha (±1,564 ha) according to mapping by Tozer (2003), which covered the Cumberland Plain. This is reported by the final determination as being a reduction from the 'Pre-European distribution' by 8.8% (±1.2%) suggesting the Pre-European distribution of the community to cover approximately 125,613 ha. According to the Map of Critically Endangered Ecological Communities NSW Version 6 dated 25/02/2020 (Department of Planning 2020) the extant of Cumberland Plain Woodland in NSW is approximately 23,021 ha (**Figure 14**). This mapping dataset has been derived from the extraction of relevant vegetation map units contained in a variety of existing vegetation mapping projects held by DPIE. Following a review of the above information for the extent of Cumberland Plain Woodland, both current and prior to European settlement, it is clear there is some variation in area calculations. Therefore, the total current area of the community is likely to be an in the middle of these areas. It is noted however, that it is unanimously accepted by all sources that the community has suffered extensive clearing to a level that the community requires significant external intervention to maintain and recover the community within the Sydney Basin Bioregion.

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
		The estimated reduction in the geographic extent of Cumberland Plain Woodland since 1970 is not available in the TBDC, BioNet, the final determination or the recovery plan, and was not identified from a search of available literature. Nonetheless, the pre-European extent of Cumberland Plain Woodland is listed as approximately 125,449 ha within the Cumberland Plain Recovery Plan as previously mentioned. No published data was found in the literature on the 1970 extent of Cumberland Plain Woodland and an accurate estimate of the reduction in distribution between the current extent and the 1970 geographic extent cannot be provided.
(b)	The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: i. Change in community structure ii. Change in species composition iii. Disruption of ecological processes iv. Invasion and establishment of exotic species v. Degradation of habitat; and vi. Fragmentation of habitat	According to the final determination for Cumberland Plain woodland CEEC (NSW Scientific Committee 2011), the ecological community has undergone, is observed, estimated, inferred or reasonably suspected to have undergone or is likely to undergo a very large reduction in the ecological function of the community through processes such as: • Extensive removal of large old trees; • Tree-felling for crops and pastures; • Fragmentation of habitat; • Grazing by livestock and rabbits; • Modification of understory, to be dominated by woody exotic species; • Soil chemical and structural modification associated with agricultural uses; • Changes in frequency of fire regimes;

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
		• Prevention of recruitment of species, through continued under-scrubbing and mowing; and • Reduction of understorey complexity, through the reduction of native shrub cover, resulting in degradation of habitat.
(c)	Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the: **i.** extent of occurrence **ii.** area of occupancy, and **iii.** number of threat defined locations	Paragraph 11 of the NSW Scientific Final Determination for Cumberland Plain Woodland notes that the TEC is restricted to the Sydney Basin Bioregion. Based on map data from Tozer (2003), the TEC was estimated to occur within an extent of occurrence of 2,810km^2 and an area of occupancy of just under 2,100 m^2, As previously discussed in this assessment, based on current available information from various mapping projects it is estimated that the current area of occupancy is approximately 23,021 ha, as shown in **Figure 14.** No threat defined location are specifically identified in the TBDC, however the ecological community is critically endangered across its range. According to the final determination, small protected areas of the community exist in reserves such as Kemps Creek, Mulgoa and Windsor Downs, Scheyville NP, and Leacock, Rouse Hill and Western Sydney Regional Parks.
(d)	Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	This principle is not identified as applicable to Cumberland Plain Woodland. The TEC does respond to management, with several successful management measures outlined in the Best Practice Guidelines for Cumberland Plain Woodland (DEC (NSW) 2005).

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
3	Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the assessor must record this in the BDAR.	Not applicable.
4 (a)	The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: i. in hectares; and ii. as a percentage of the current geographic extent of the TEC in NSW	The proposal will remove approximately 1.16 ha of Cumberland Plain Woodland in the subject land. The extent of the TEC in NSW differs depending on the information source. Based on a review of vegetation mapping layers, the estimated geographic extent in NSW is between approximately 11,000 ha and 25,000 ha according to resources reviewed for *BAM Section Criteria 2. a)*. However, based on the existing literature, the lowest number quoted for the estimated geographic extent of Cumberland Plain Woodland is 11,054 ha (NSW Scientific Committee 2011). Based on the two numbers outlined above, the extent of Cumberland Plain Woodland to be impacted by the proposal is approximately 0.01% of the current geographic extent of the TEC in NSW.
(b)	The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:	
	Estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500m of the development footprint or equivalent area for other types of proposals	The proposal requires the removal of 1.16 ha of CPW within the subject land and will result in further isolation of CPW from larger areas within the assessment area. The isolated area of CPW remaining within the patch land consists of scattered paddock trees that form stepping

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
		stone habitat. The proposed development will result in the formation of two isolated areas adjacent to the subject land, however, it is noted that future development of the adjacent land as part of the Mamre Road Precinct is likely to result in the removal of the remaining areas of CPW. Based on the OEH's (2016a) mapping of the Sydney Metropolitan Area, there is approximately 12.28 ha of Cumberland Plain Woodland within 500m of the development footprint (subject land). Hence, the removal of 1.16 ha of Cumberland Plain Woodland in the subject land represents ~9% of the occurrence of the TEC within 500m of the development footprint.
	Describing the impacts on connectivity and fragmentation of the remaining areas of the TEC measures by: Distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and	Approximately 1.16 ha of Cumberland Plain Woodland occurs within the subject land. The closest area of CPW to the subject land is approximately 86m to the north east. The removal of Cumberland Plain Woodland within the subject land will result in further separation of these two area, which will end up being approximately 350m apart. These isolated areas of CPW consist of scattered paddock trees that form stepping stone habitat. The proposed development includes the establishment of a biodiversity corridor across the subject land. The creation of a biodiversity corridor will provide improved connectivity of areas of the TEC across the subject land.

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
	Estimated maximum dispersal distance for native flora species characteristic of the TEC, and	The main dispersal mechanisms for flora species associated with Cumberland Plain Woodland include one or a combination of the following: • Animals, • Wind, • Water runoff, and • Gravity. Eucalypts within the community are likely to rely on animal assisted dispersal by highly mobile vertebrate pollinators (birds and bats) which disperse pollen over large areas when foraging (Southerton S.G. 2003). The maximum dispersal distance for native flora species characteristic of the community is estimated to be at least 1000 m and potentially much further. The proposed development includes the establishment of a biodiversity corridor across the subject land. Although scattered paddock trees will be further isolated by the proposed development, the creation of a biodiversity corridor will provide connectivity across the subject land and minimise dispersal distances for native flora species.
	Other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development	The area of CPW within the subject land is part of a remnant patch native vegetation which currently has an area to perimeter ratio of approximately 9:1. Following clearing for the project the area perimeter ratio of the remnant will be approximately 13:1.

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
		As previously described, the project is not considered to significantly affect the connectivity of the TEC, as the vegetation proposed for removal consists of a small remnant patch within a highly degraded landscape. Furthermore, the establishment of a biodiversity corridor within the re-aligned E2 zone will continue to facilitate and contribute to the connectivity of the TEC.
	Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.	Within the site Cumberland Plain Woodland corresponds to PCT 850 and two vegetation zones. The occurrence of the TEC in the subject land is mainly limited to canopy trees with a degraded understory. Zone 1 850 Moderate: • The vegetation integrity score is: 34.3 • The composition score is: 22.6 • The structure score is: 49.0 • The function score is: 36.7 Zone 2 850 Low: • The vegetation integrity score is: 12.3 • The composition score is: 8.2 • The structure score is: 22.0 • The function score is: 10.3

BAM Section 9.1.1 Criteria	Additional Impact Assessment Provisions	Response
5	The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	The area of CPW within the subject land is part of a remnant patch of native vegetation which currently has an area to perimeter ratio of approximately 9:1. Following clearing for the project the area perimeter ratio of the remnant will be approximately 13:1. As previously described, the project is not considered to significantly affect the connectivity of the TEC, as only a relatively small are of CPW will be removed. As part of the project, a biodiversity corridor will be established which will continue to facilitate and contribute to the connectivity of the TEC across the wider assessment area. Furthermore, the patch of CPW within the subject land has been identified as Certified land under the Draft CPCP and is likely to be bio-certified in future years. As such, it is considered likely that this small area of CPW would be cleared in future years without the requirement for further assessment.

10.3. Impacts that Require an Offset

10.3.1. Native Vegetation

In accordance with the BAM, the project requires offsets for the clearing of native vegetation as the following criteria are met:

- A vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an EEC or CEEC.

The PCT and vegetation zones requiring offsets are documented in **Table 21**. These areas are mapped in **Figure 13**.

Table 21 Summary of impacts to native vegetation requiring an offset

Vegetation Zone	PCT #	PCT Name	Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score
1	850_Moderate	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	0.97	34.4	-34.4
3	1800_Moderate	Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	0.31	50.5	-50.5
4	1800_Low	Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	0.68	38.6	-38.6

10.3.2. Threatened Species

An offset is required for one threatened species impacted by the project that is determined to be species credit species. The relevant species and associated species credits required are documented in **Table 22** below.

Table 22 Summary of impacts to threatened species requiring an offset

Scientific Name	Common Name	Area (ha)
Myotis macropus	Southern Myotis	2.12

10.4. Impacts that do not Require an Offset

In accordance with Appendix D of the BAM, no offsetting is required for the planted native vegetation. Additionally, no offsetting is required for Zone 2 (PCT 850_low condition) as the vegetation integrity scores is <15, as shown in **Table 23**.

Table 23 Summary of impacts to native vegetation that do not require an offset

Vegetation Zone	PCT #	PCT Name	Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score
2	PCT 850_Low	Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion	0.19	12.3	-12.3

10.5. Impacts that do not Require Further Assessment

All areas identified as cleared land and exotic vegetation that occur within the subject land do not require an offset. These areas comprise approximately 31.01 ha, and comprise all unmapped areas on **Figure 13.**

10.6. Application of the No Net Loss Standard

The BAM sets a standard that will result in no net loss of biodiversity values where the impacts on biodiversity values are avoided, minimised and mitigation, and all residual impacts are offset by retirement of the required number of biodiversity credits. The project will result in the removal of 1.16 ha native vegetation that conforms to the TEC Cumberland Plain Woodland (PCT 850) and 0.98 ha of native vegetation that conforms to the TEC Swamp Oak Floodplain Forest (PCT 1800).

The removal of vegetation will result in the loss of 2.12 ha of habitat for the Southern Myotis.

The ecosystem credit requirement for the project is summarised in **Table 24**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 25**. The species credit requirement for the Project is summarised in **Table 26**.

A credit summary report from the BAM-C has been included in **Appendix B**.

The proponent has the ability to satisfy the credit liability in accordance with the offset rules described in Clause 6.2 of the BC Regulation. It is likely that the options to be pursued by the proponent are:

- The retirement of the required number and class of like-for-like biodiversity credits; and/or
- Payment into the Biodiversity Conservation Fund determined in accordance with the offsets payment calculator to satisfy the requirement to retire biodiversity credits.

Table 24 Summary of ecosystem credit liability

PCT #	PCT Name	TEC	Area (ha)	Credits Required
850	Grey Box - Forest Red Gum grassy woodland on shale of	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.97	21

PCT #	PCT Name	TEC	Area (ha)	Credits Required
	the southern Cumberland Plain, Sydney Basin Bioregion			
1800	Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.31	8
1800	Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley	Not a TEC	0.68	11

Table 25 Like for like offsetting options

Any PCT with the below TEC	Containing Hollow-bearing Trees?	In the below IBRA Subregions
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	Yes	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.
Coastal Floodplain Wetlands This includes PCT's: 780, 828, 835, 926, 1234, 1235, 1386, 1651, 1720, 1727, 1728, 1800	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

Table 26 Summary of species credit liability

Species	Vegetation Zone	Area / Count	Credits
Myotis macropus / Southern Myotis	850_Zone1 850_Zone2 1800_Zone3 1800_Zone4	2.1	39

11. Conclusion

This BDAR has been prepared to assess the impacts of the proposed development on biodiversity values, in accordance with the BAM. The project involves the demolition of existing structures and removal of vegetation to allow for the construction of five warehouses and associated infrastructure. This BDAR will form part of the required Environmental Impact Statement (EIS) to support an application for a State Significant Development (SSD) under Part 4, Division 4.7 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act).

Native vegetation occurring within the subject land occurs as scattered patches and consists of planted and remnant native vegetation. Two PCT's have been identified within the subject land, PCT 850 and PCT 1800, each occurring in two condition states. The PCT's within the subject land align with two TECs listed under the BC Act, including Cumberland Plain Woodland CEEC and Swamp Oak Floodplain Forest EEC. The remainder of the subject land comprises exotic vegetation, farm dams and previously cleared land.

The project requires the removal of all native vegetation within the subject land. As the project includes the removal of native vegetation, a number of offsets are required in the form of ecosystem credits. This assessment indicates that the removal of the native vegetation within the subject land requires a total of 21 ecosystem credits of PCT 850 and 19 ecosystem credits for PCT 1800.

No threatened flora species that are considered as species credit species were recorded within the subject land and none are considered likely to occur. Therefore, no flora species credits species are required to be offset. One threatened fauna species, Southern Myotis (*Myotis macropus*) was recorded within the subject land and therefore, the removal of habitat within the subject land requires a total of 39 species credits.

When considering the requirements associated with the IN1 zoning and the extent of earthworks required for the site to be compatible with an industrial development, in combination with the scattered nature of the native vegetation within the subject land, opportunities to avoid impacts to biodiversity values are limited. As a result, all native vegetation within the site is proposed to be removed as part of the project.

Although several iterations of the design of the development footprint have been produced, specific site constraints in relation to the existing landform had to be considered when finalising the development footprint location and design. Extensive consultation with DPIE and NRAR has also been undertaken in order to prepare the final development footprint configuration. As a result, the existing E2 zone will be realigned and revegetated as part of the project, to create a biodiversity corridor that runs through the subject land and links habitats on either side of the site.

Further impacts of the project may entail potential indirect impacts, including inadvertent impacts on adjacent habitat and reduced viability of adjacent habitat due to noise, dust or light spill, and prescribed impacts such as impacts to non-native vegetation and connectivity of different areas of habitat that facilitates movement across a species range have been considered.

A suite of mitigation measures is proposed to minimise and manage the impacts to biodiversity values, such as, weed management, pre-clearance surveys, sediment management, staging of clearing, and a dam dewatering plan. Furthermore, the restoration and revegetation of a biodiversity corridor within the re-aligned E2 zone is proposed to be managed under a Vegetation Management Plan.

With the implementation of the proposed mitigation measures and the offsetting described previously, it is considered that the impacts of this project on biodiversity, in particular on TEC and threatened species, will be limited and can be enhanced and appropriately managed in the future.

The proposed development is considered to be consistent with the No Net Loss standard as impacts to biodiversity values have been avoided/minimised/mitigated where feasible and all residual impacts are to be offset by retirement of the required number of biodiversity credits.

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APPENDIX A :
BAM Plot Data

plot	pct	area	patchsize	conditionclass	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
1	850	0.97	3.9	Zone1	1	0	8	2	0	0	30.0	0.0	33.2	0.2	0.0	0.0	4	0	7.0	5.0	0	0	0	0	1	0	40.3
2	850	0.97	3.9	Zone1	1	0	8	0	0	0	20.0	0.0	36.1	0.0	0.0	0.0	3	1	6.0	2.0	0	0	0	1	1	0	45.0
9	850	0.19	3.9	Zone2	0	0	3	0	0	0	0.0	0.0	3.1	0.0	0.0	0.0	1	1	4.8	3.0	0	0	0	0	0	0	71.2
4	1800	0.31	3.9	Zone3	1	0	7	4	0	0	50.0	0.0	60.6	0.6	0.0	0.0	0	0	15.0	35.0	1	1	1	1	0	0	25.1
5	1800	0.68	3.9	Zone4	1	0	5	4	0	0	35.0	0.0	31.0	0.4	0.0	0.0	0	0	6.0	49.0	0	1	1	1	0	0	65.1

APPENDIX B :
BAM-C Credit Reports

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024598/BAAS17027/21/00024599	19200 - Kemps Creek	29/03/2021
Assessor Name	Report Created	BAM Data version *
David Robertson	23/04/2021	38
Assessor Number	BAM Case Status	Date Finalised
BAAS17027	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

* 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)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cumberland shale hills woodland											
1	850_Zone1	Cumberland Plain Woodland in the Sydney Basin Bioregion	34.4	34.4	0.97	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	21
										Subtotal	**21**

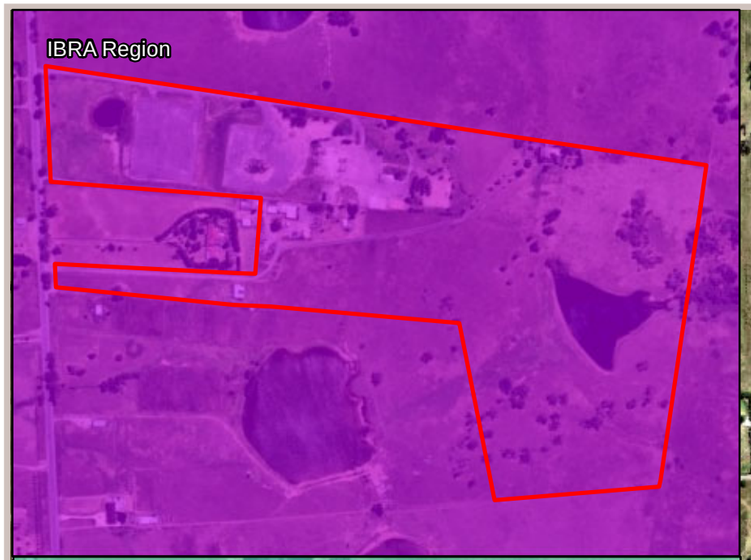
Cumberland shale hills woodland											
2	850_Zone2	Not a TEC	12.3	12.3	0.19			High Sensitivity to Potential Gain	2.00		0
										Subtotal	**0**
Cumberland Swamp Oak riparian forest											
3	1800_Zone 3	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	50.5	50.5	0.31	Endangered Ecological Community	Endangered	High Sensitivity to Potential Gain	2.00		8
										Subtotal	**8**
Cumberland Swamp Oak riparian forest											
4	1800_Zone 4	Not a TEC	38.6	38.6	0.68			High Sensitivity to Potential Gain	1.75		11
										Subtotal	**11**
										Total	**40**

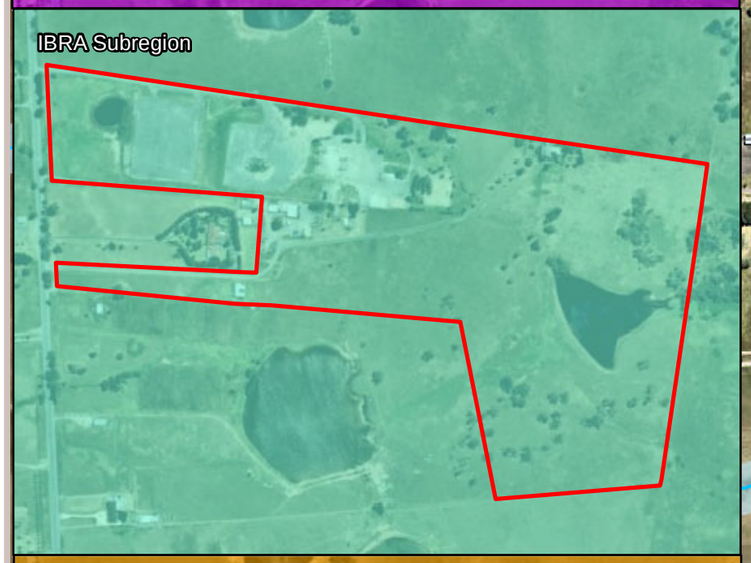
Species credits for threatened species

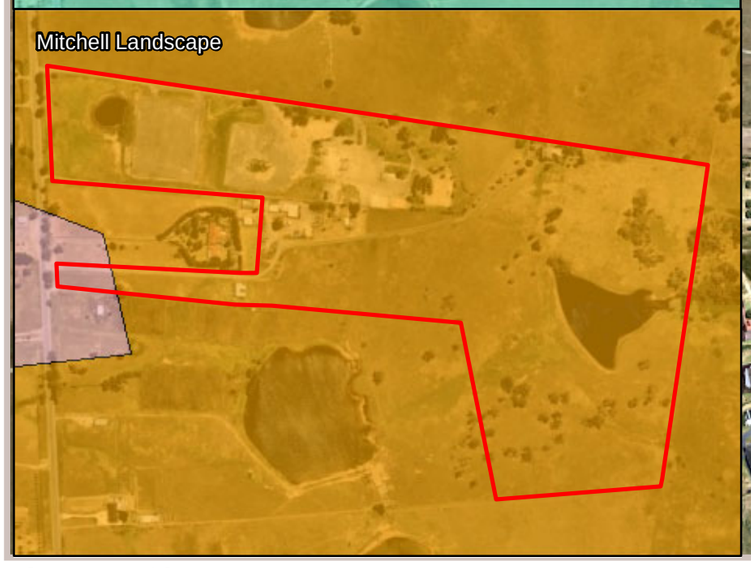
Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Myotis macropus / Southern Myotis (Fauna)								
850_Zone1	34.4	34.4	0.97	Vulnerable	Not Listed	2	False	17
850_Zone2	12.3	12.3	0.16	Vulnerable	Not Listed	2	False	1

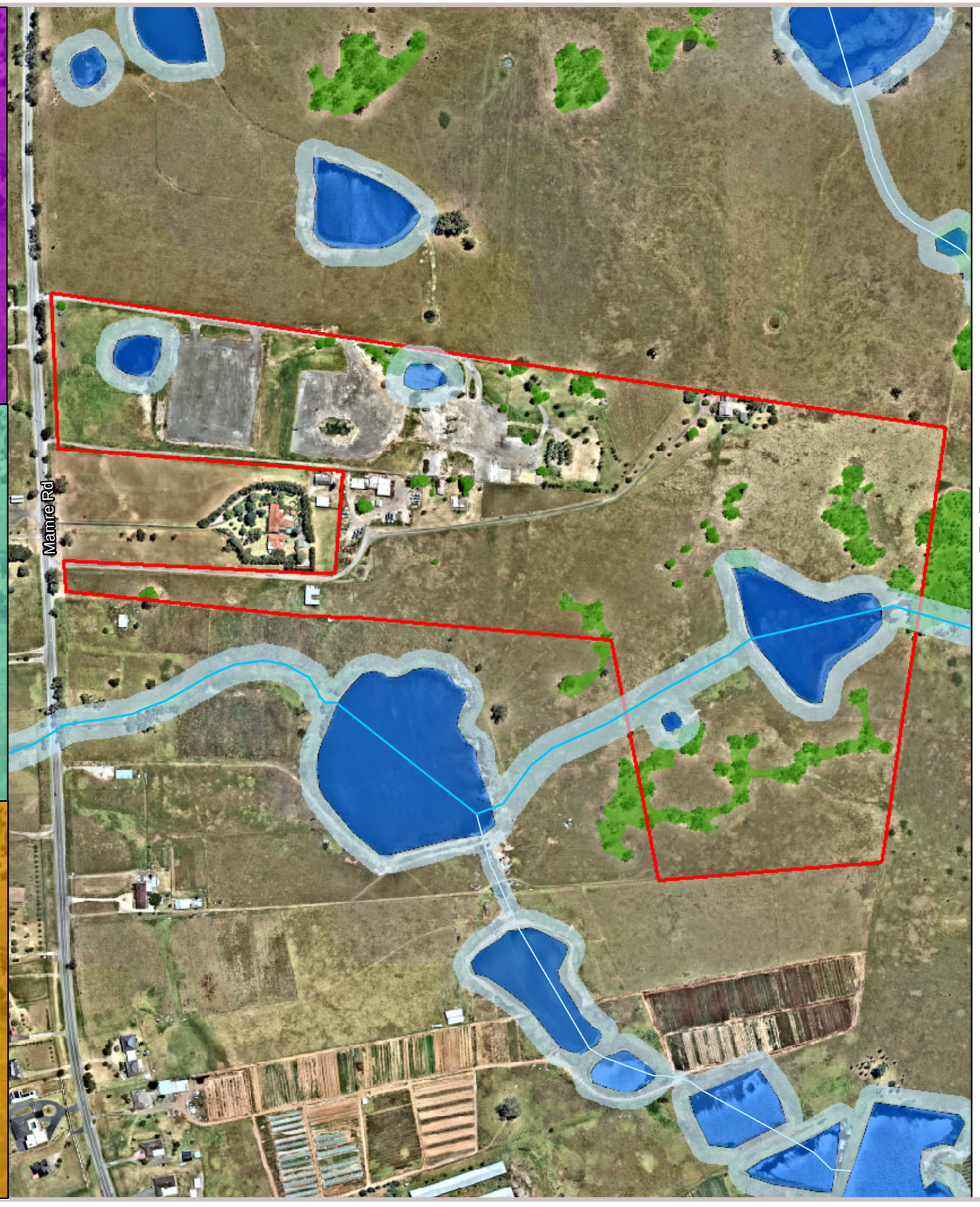
1800_Zone3	50.5	50.5	0.31	Vulnerable	Not Listed	2	False	8
1800_Zone4	38.6	38.6	0.68	Vulnerable	Not Listed	2	False	13
							Subtotal	**39**

FIGURES









Legend

- Subject Land
- Native Vegetation Cover
- Riparian Buffers
- Wetland

Watercourse

- 1st order
- 2nd order
- 4th and 5th order
- 6th order or above

IBRA Region

- Sydney Basin

IBRA Subregion

- Cumberland

Mitchell Landscape

- Cumberland Plain
- Hawkesbury - Nepean Channels and Floodplains

Image Source:
Image © NearMap 2021
Dated: 26/01/2021
Data Source:
DECCW (2008). Landscapes (Mitchell) of NSW - Version 3.
DSEWPaC (2012). Interim Biogeographic Regionalisation for Australia (IBRA) - Version 7.

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 25 50 100 150 200 m

I:\...\19200\Figures\RP1\20210421\Figure 1. Site Map

Figure 1. Site Map

IBRA Region

IBRA Subregion

Mitchell Landscape

Legend

- Subject Land
- Assessment Area (1500
- Native Vegetation Cover
- Riparian Buffers
- Wetland

Watercourse

- 1st order
- 2nd order
- 4th and 5th order
- 6th order or above

IBRA Region

- Sydney Basin

IBRA Subregion

- Cumberland

Mitchell Landscape

- Cumberland Plain
- Hawkesbury - Nepean Channels and Floodplains
- Sydney Basin Diatremes

Image Source:
Image © NearMap 2021
Dated: 26/01/2021
Data Source:
DECCW (2008). Landscapes (Mitchell) of NSW - Version 3.
DSEWPaC (2012). Interim Biogeographic Regionalisation for Australia (IBRA) - Version 7.

Coordinate System: MGA Zone 56 (GDA 94)

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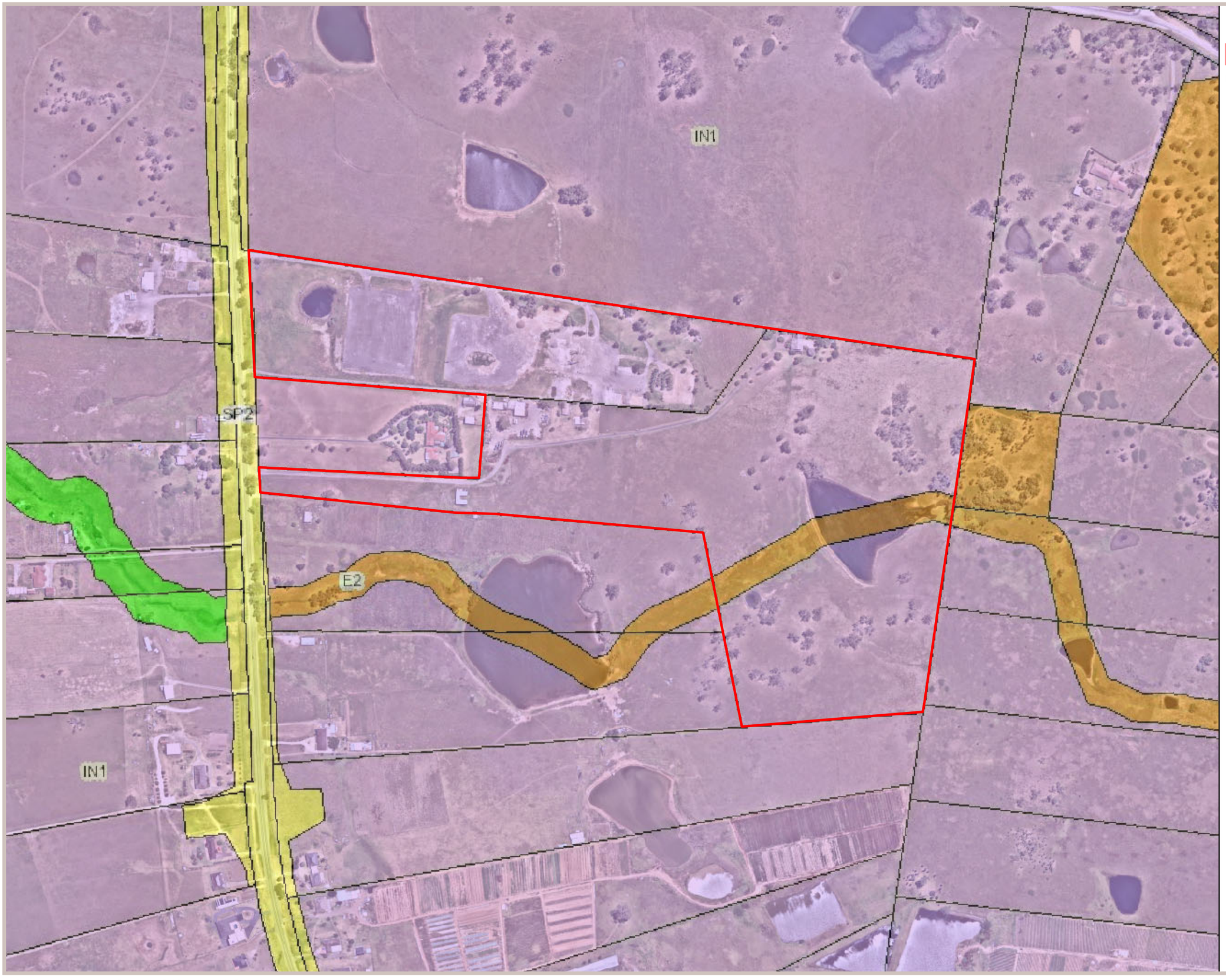
0 125 250 500 750 1,000 m

I:\...\19200\Figures\RP1\20210421\Figure 2. Location Map

Figure 2. Location Map



Legend

Subject Land

Land Use Zone

E2 - Environmental Conservation

IN1 - General Industrial

RE1 - Public Recreation

SP2 - Infrastructure

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Department of Planning,
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Data Source:
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Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19200\Figures\RP1\20210421\Figure 3. Zoning_Subject Land

Figure 3. Zoning of the subject land

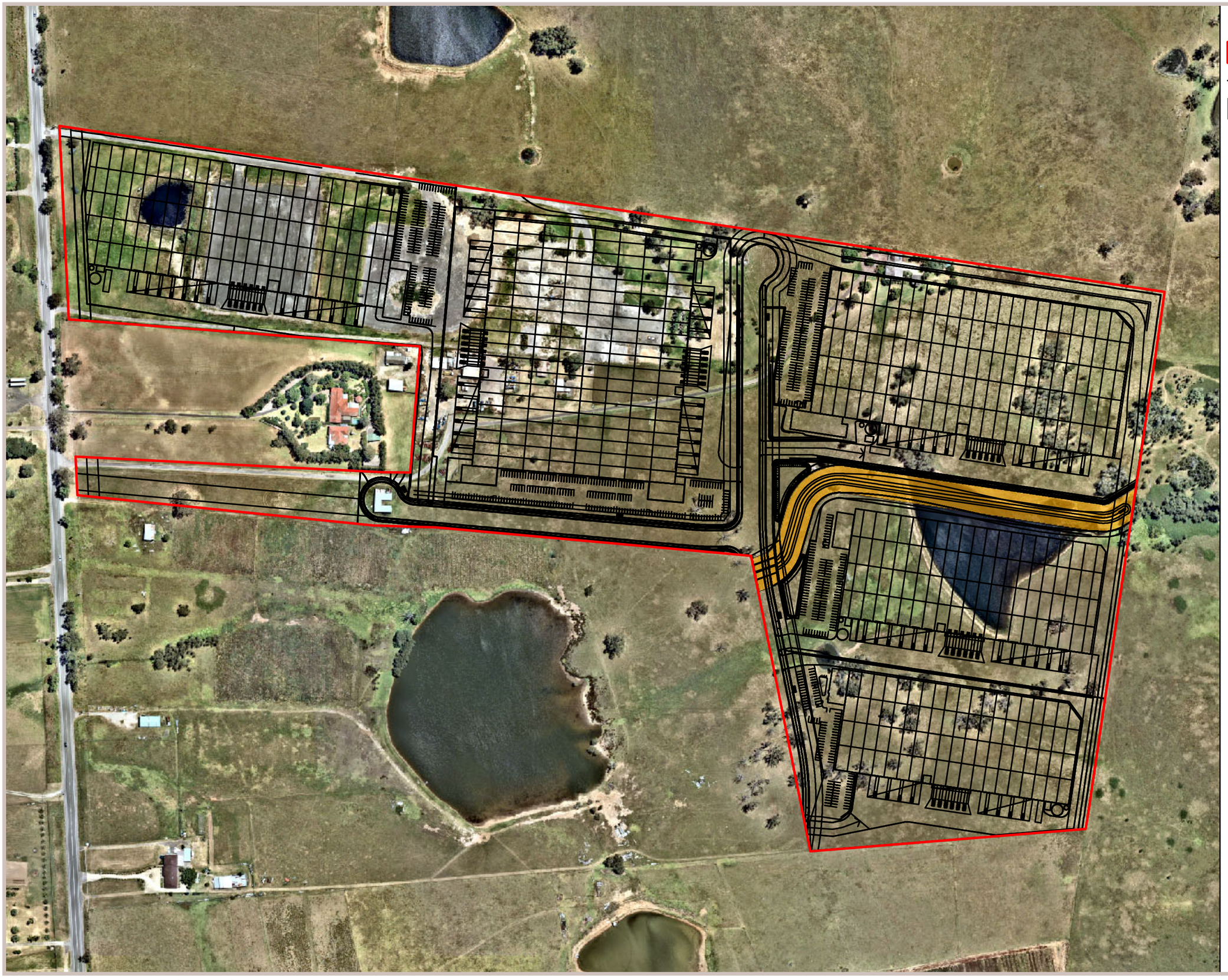
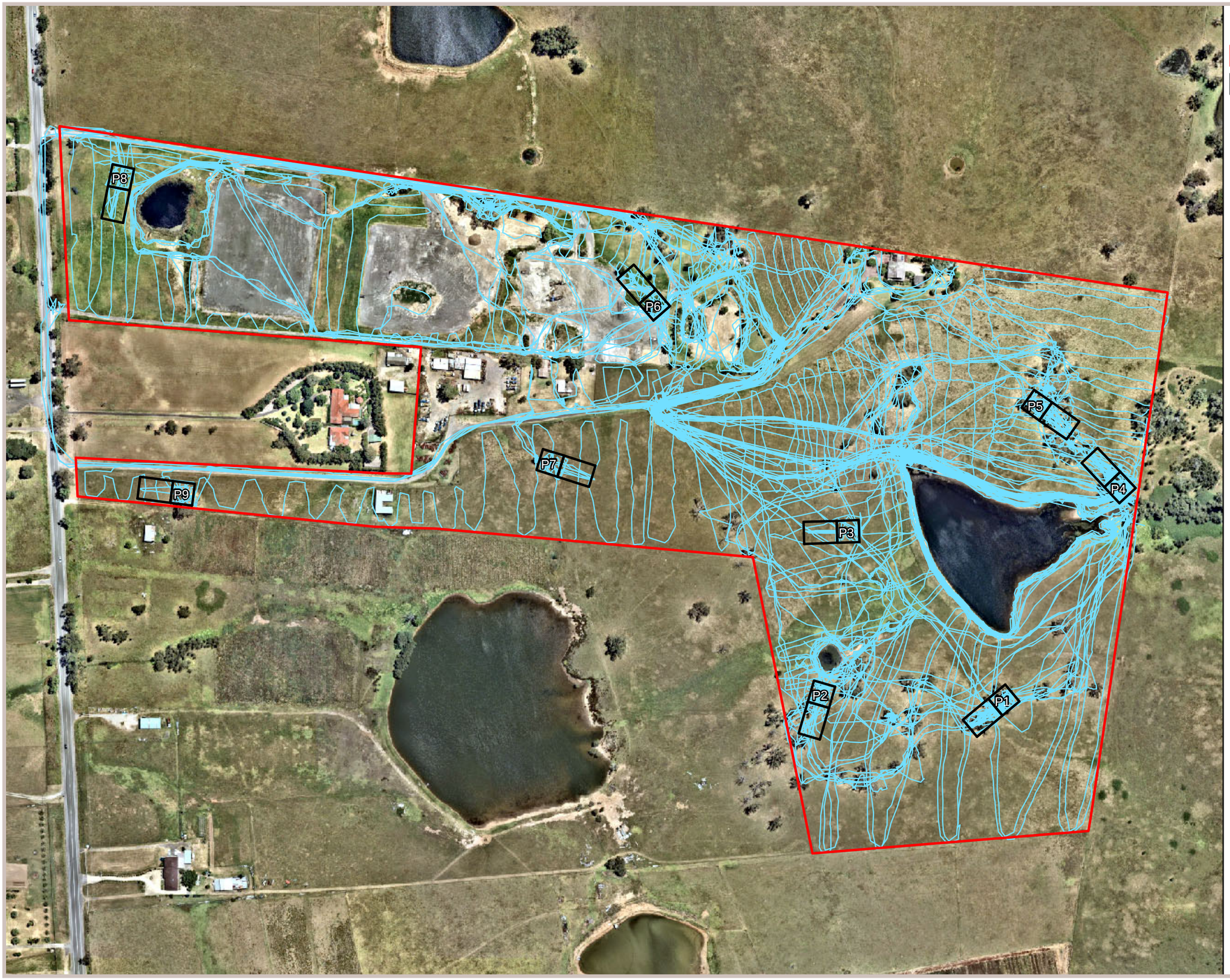


Figure 4. Layout of the project



Legend

- Subject Land
- BAM Plot
- Parallel Traverses

Image Source:
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Dated: 26/01/2021
Data Source:
Spatial Services
Sixmaps Clip & Ship
NSW Department of
Finance and Services

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19200\Figures\RP1\20210421\Figure 5. Flora survey locations

Figure 5. Flora survey locations

Figure 6. Fauna survey locations

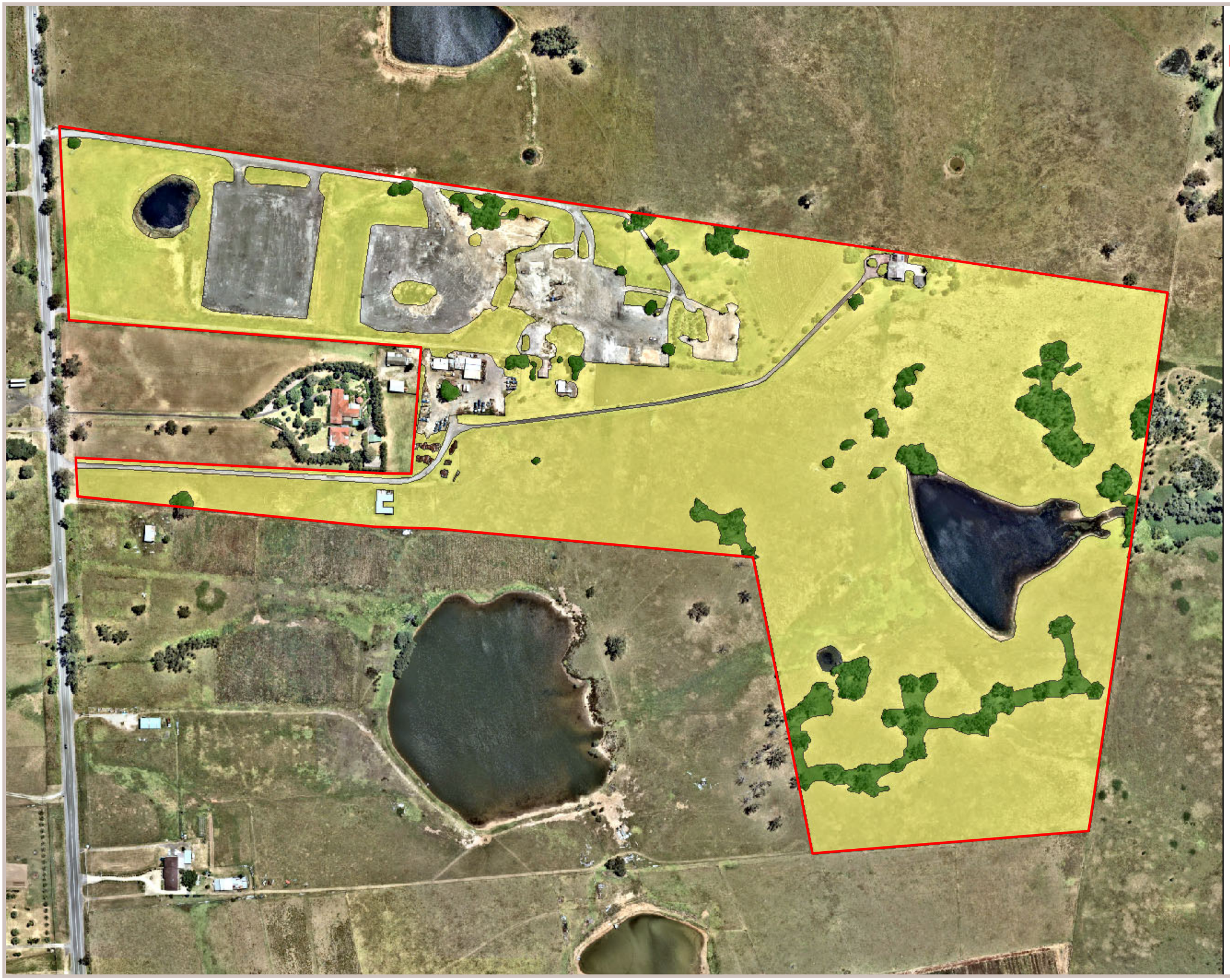

Figure 7. Native vegetation extent within the subject land

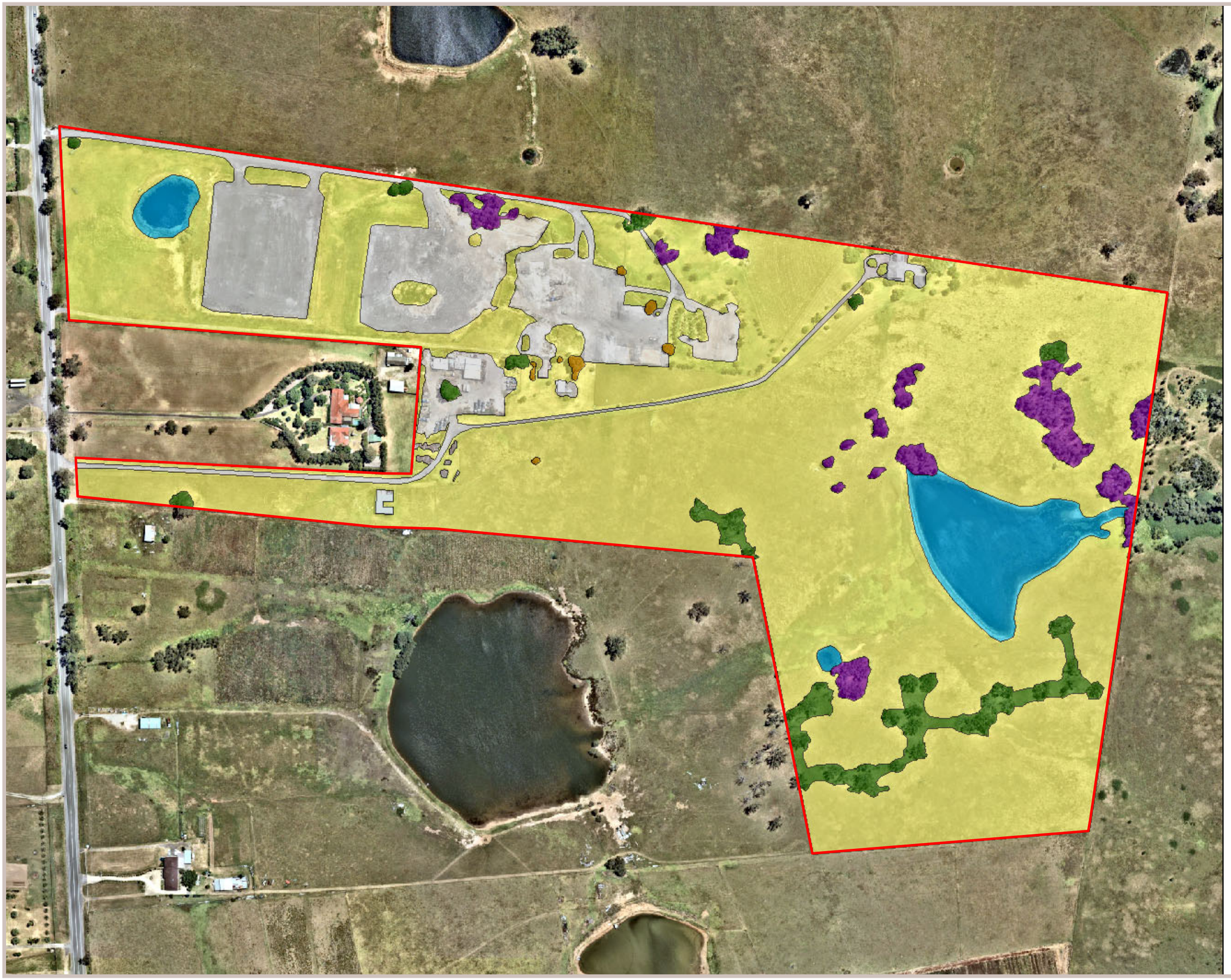

Figure 8. Plant community types within the subject land

Legend

Subject Land

Threatened Ecological Community

Cumberland Plain Woodland in the Sydney Basin Bioregion

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Image Source:
Image © NearMap 2021
Dated: 26/01/2021
Data Source:
Spatial Services
Sixmaps Clip & Ship
NSW Department of
Finance and Services

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19200\Figures\RP1\20210421\Figure 9. TECs_Subject Land

Figure 9. Threatened ecological communities within the subject land

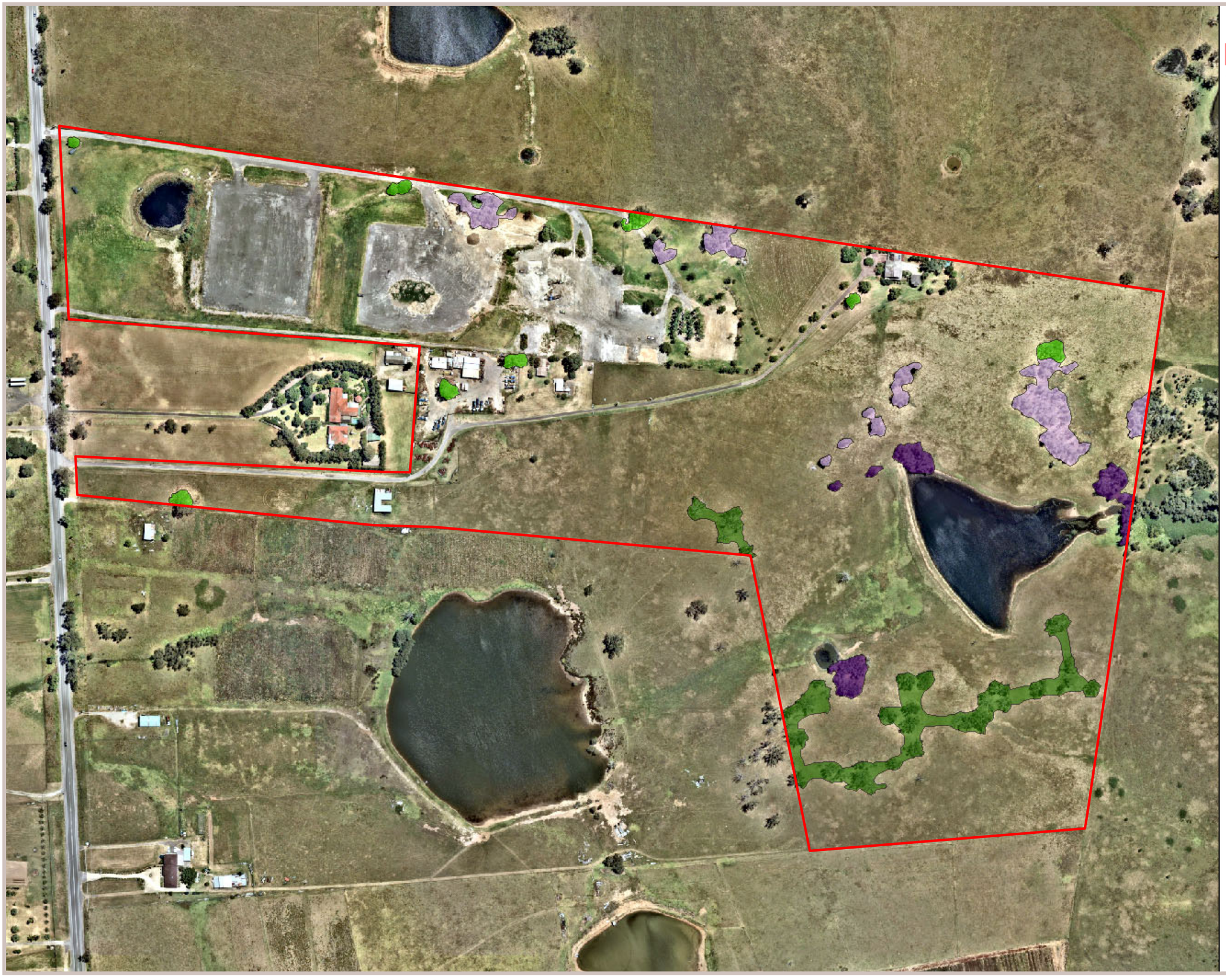

Figure 10. Vegetation zones within the subject land

Legend

Subject Land

Species Polygon

Southern Myotis (Myotis macropus)

Image Source:
Image © NearMap 2021
Dated: 26/01/2021
Data Source:
Spatial Services
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NSW Department of
Finance and Services

Coordinate System: MGA Zone 56 (GDA 94)

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0 25 50 100 150 200 m

I:\...\19200\Figures\RP1\20210421\Figure 11. Species Polygons_Subject Land

Figure 11. Species credit species polygons

Legend

- Subject Land
- Human Made Structures
- Habitat Connectivity

Non-native Vegetation

- Exotic Vegetation

Hydrological Processes

- Dams
- 1st order
- 2nd order

Image Source:
Image © NearMap 2021
Dated: 26/01/2021
Data Source:
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NSW Department of
Finance and Services

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\19200\Figures\RP1\20210421\Figure 12. Prescribed Impacts_Subject Land

Figure 12. Extent of prescribed impacts

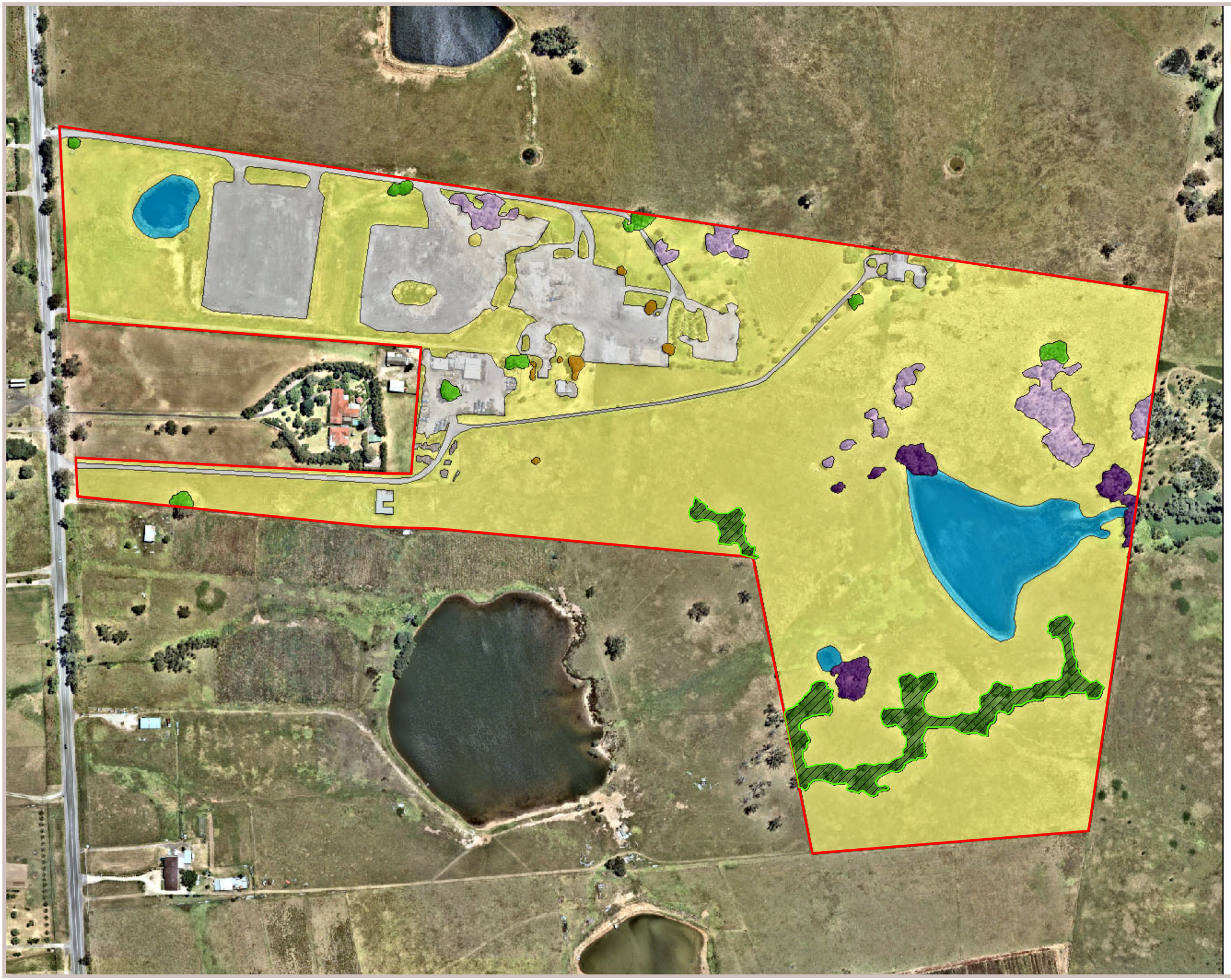
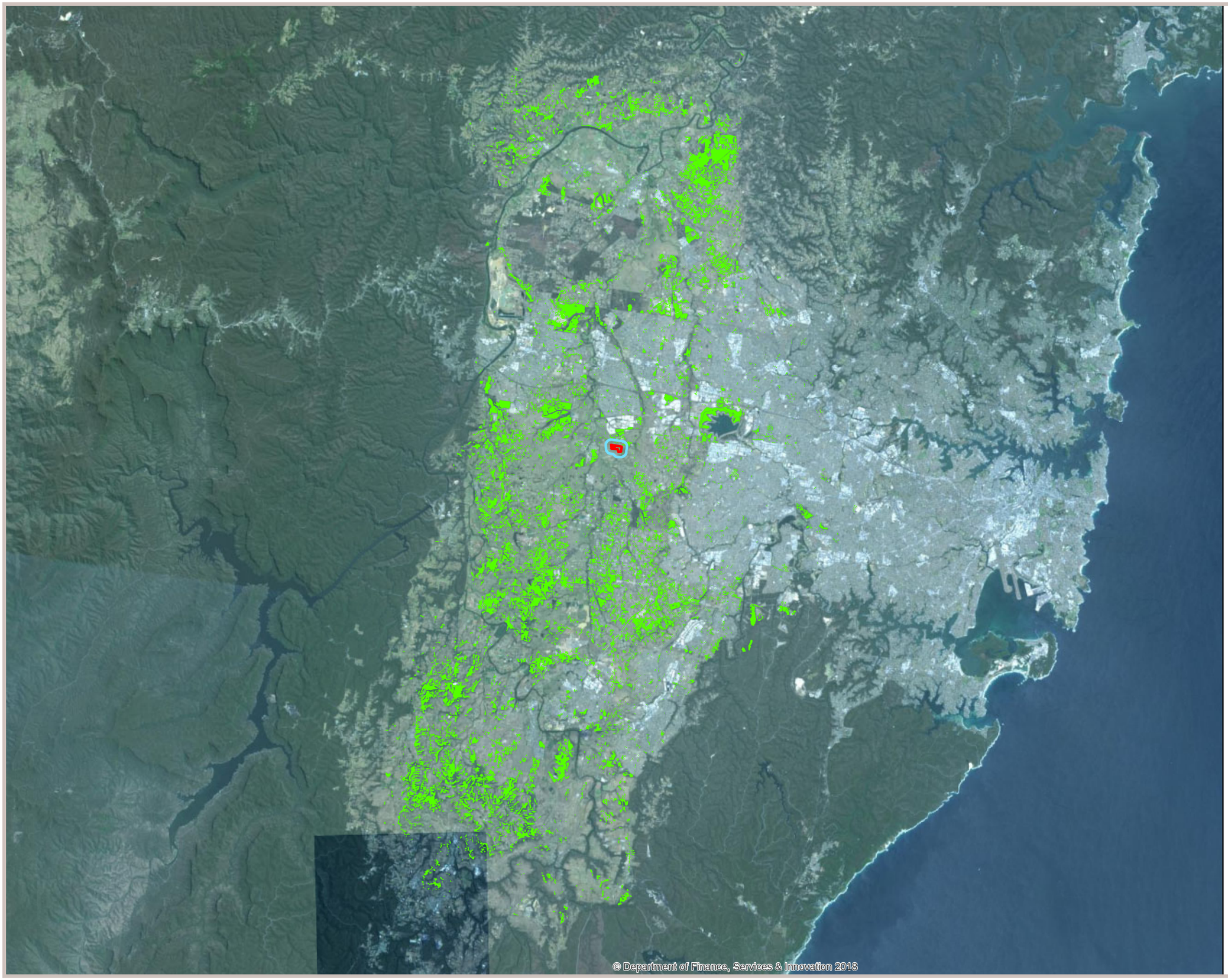


Figure 13. Thresholds for assessment



Legend

Subject Land

SAII Assessment Area (500

Critically Endangered Ecological Community

Cumberland Plain Woodland in the Sydney Basin Bioregion

Data Source:
Spatial Services
Sixmaps Clip & Ship
NSW Department of
Finance and Services

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 2.5 5 10 15 20 km

I:\...\19200\Figures\RP1\20210421\Figure 14. CPW CEEC Map

Figure 8. Plant community types within the subject land