St John of God Richmond Hospital Redevelopment

Biodiversity Development Assessment Report

St John of God Health Inc

9 October 2020

Final

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Report No. 19166RP1

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.

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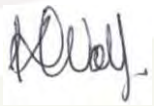
Signed:	
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Glossary

Term / Abbreviation	Definition
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
BAMC	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
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
DAWE	Commonwealth Department of Agriculture, Water and the Environment
EEC	Endangered Ecological Community
EES	Environment, Energy and Science Group
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
NSW	New South Wales
MNES	Matters of National Environmental Significance
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
the Project	Proposed redevelopment of the St John of God Hospital
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy
Subject land	The land proposed as a development site (see **Figure 3**)
TEC	Threatened Ecological Community

1. Introduction

Cumberland Ecology was commissioned by St John of God Health Care to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed redevelopment of the St John of God Hospital (the 'project'). The project involves the redevelopment of the existing hospital facility including the demolition of a portion of the existing facilities, upgrading of existing facilities, and construction of new facilities. 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

Under the NSW *Biodiversity Conservation Act 2016* (BC Act), all SSDs require the preparation of a BDAR in accordance with the Biodiversity Assessment Method (BAM), unless a waiver is granted by the Department of Planning, Industry and Environment and the Environment, Energy and Science Group (EES). Due to the development footprint extending into a Threatened Ecological Community (TEC), a waiver was not sought, and therefore this BDAR has been prepared. The project qualifies for the Streamlined Assessment Module – small area development as it involves the clearing of ≤1 ha of native vegetation, none of which occurs on the Biodiversity Values Map as at 8 October 2020.

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 at 235 Grose Vale Road, North Richmond, NSW, and is also known as Lot 11 DP 1134453, with a small area extending into Lot 14 DP 703300 (hereafter referred to as the study area). The study area is located approximately 2 km south west of the North Richmond town centre and is located within the Hawkesbury Local Government Area. The study area is surrounded by rural and primary production land uses.

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively.

1.3.2. Project Overview

The project comprises the redevelopment of the existing St John of God Richmond Hospital and includes the following:

- Partial demolition of existing facilities;
- Upgrade of retained clinical facilities to contemporary, best-practice standards;
- Construction of new clinical and support facilities including increased bed capacity from 88 beds to 112 beds;
- Construction of new chapel to replace the existing chapel to be demolished; and
- Integrated landscaping.

To ensure the hospital remains in operation during constructions works, the project will be staged to allow for separate construction and operation stages.

1.3.3. Identification of the Development Site Footprint

The layout of the project is shown in **Figure 3**. The development site footprint comprises the area of land directly impacted by the project including the existing buildings to be demolished), new facilities 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.

1.3.4. General Description of the Development Site

The study area was historically, and continues to be used as a hospital facility. Remnant native vegetation occurs at the north western boundary and south eastern boundary of the study area. The remaining vegetation comprises mixed native and exotic plantings including along the access driveway and surrounding the existing car park and buildings. The subject land comprises buildings, access roads and landscaped areas.

The study area slopes from the north western boundary (approximately 80 m Australian Height Datum) to the south eastern boundary (40 m Australian Height Datum). The Hawkesbury River occurs approximately 150 m from the south eastern boundary of the study area. The subject land falls within the Luddenham soil landscape, which comprises undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone.

The study area is identified as containing a local heritage item under the *Hawkesbury Local Environmental Plan 2012*, being 'St John of God Hospital (former "Belmont Park", mansion, garden, building, gatehouse and curtilage)'. A place of Aboriginal cultural heritage significance, the Battle of Richmond Hill memorial garden, occurs in the north eastern corner of the study area.

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

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 (2016): 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 17 December 2019. Additional aerial images available on NearMap and SixMaps were also consulted.

1.5. Authorship and Personnel

This document has been prepared by Katrina Wolf (BAM Accredited Assessor No: 18010). This document, and associated field surveys and Geographic Information Systems (GIS) mapping, was 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 Ms Wolf's.

Table 1 Personnel

Name	Tasks	Relevant Qualifications / Training	BAM Accredited Assessor No.
Katrina Wolf	Document preparation, field surveys document review	Bachelor of Science (Environmental). The University of Sydney, 2007 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18010
Matthew Freeman	Document preparation, field surveys	Bachelor of Natural Science (Nature Conservation). University of Western Sydney, 2012 BAM Accredited Assessor Training. Muddy Boots, 2018	BAAS19019
Mikael Peck	Field surveys	Master of Marine Science and Management. Macquarie University, 2013 Bachelor of Science. Washington State University, 2005 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS19002
Dr Rohan Mellick	Field surveys	Bachelor of Applied Science (Honours) in Natural Resource Management, Southern Cross University, 2000. Doctor of Philosophy, Evolutionary Ecology. The University of Adelaide, 2012 BAM Accredited Assessor Training. Muddy Boots, 2017	BAAS18075
John Foster	Field surveys	Bachelor of Science - Biology, Macquarie University, 2019	-
Jesse Luscombe	GIS mapping	Bachelor of Marine Science. Macquarie University, 2013 Certificate III in Conservation and Land Management. TAFE NSW, 2016 BAM Accredited Assessor Training. Muddy Boots, 2018	-

2. Methodology

2.1. Review of Existing Data

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

- Survey data that is held in the BioNet Atlas;
- The following existing ecological reports, including vegetation mapping:
    - OEH (2013) Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207; and
    - OEH (2016): The Native Vegetation of the Sydney Metropolitan Area - VIS_ID 4489.

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

2.2. Landscape Features

Landscape features requiring consideration were initially determined via desktop assessment. Field surveys undertaken on 23 January 2020 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

Broad scale mapping that encompasses the subject land and surrounds has been undertaken, and a detailed tree plan prepared by Australian Tree Consultants (2019). Cumberland Ecology conducted additional vegetation surveys on 23 January 2020 and 17 February 2020 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 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 over bark' (DBH);
    - 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 four BAM plots were undertaken within the study area on 23 January 2020, and their locations are shown in **Figure 4**. The location of plots have sought to capture the environmental variation of the PCTs identified within the study area (see ***Section 4.2***). An additional 20 x 20 m floristic plot was undertaken in a grassland area to verify whether it comprised an exotic or native grassland.

Although four BAM plots were surveyed within the study area, only two of these plots (Q1 and Q2) have been utilised in the BAM Calculator (BAMC) as they were surveyed within the two vegetation zones that will be impacted by the project. **Table 2** summarises the plot requirements based on the size and number of vegetation zones in the subject land. As shown in this table, the minimum number of plots has been completed for each vegetation zone. It is noted that due to the small nature of the subject land, the options for location plots was limited therefore the plots are not wholly located within the subject land.

Table 2 BAM plot survey requirements

Vegetation Zone	PCT	Condition	Area (ha)	Minimum Number of Plots Required	Number of Plots Completed
1	1081	Planted	0.12	1	1
2	1395	Remnant	0.06	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 Species Survey

No predicted threatened flora species were assessed as candidate species credit species requiring further assessment (see ***Section 5.3***), therefore no targeted threatened flora surveys were required to be undertaken within the subject land. Notwithstanding this, random meander surveys were undertaken within the study area to target threatened flora species. The locations of the targeted flora species surveys are shown in **Figure 4**.

2.4.2.1. Random Meander

A random meander survey and plot survey was undertaken within the study area on 23 January 2020. Due to the small area of potential habitat within the study area, a random meander was deemed appropriate for the survey, and was supplemented with the required plot survey. The random meander survey and plot survey was undertaken by a botanist and ecologist.

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.

2.5.2. Threatened Fauna Species Survey

No predicted threatened fauna species were assessed as candidate species credit species requiring further assessment (see ***Section 5.3***), therefore no targeted threatened fauna surveys were required to be undertaken within the subject land. Notwithstanding this, some targeted threatened fauna surveys were undertaken within the study area. The locations of the targeted fauna species surveys are shown **Figure 4**.

2.5.2.1. Bird Census

A bird census survey was undertaken within the study area by an ecologist on 28 and 30 January 2020. The survey included a traverse within the study area and recording only species detected visually and/or aurally within this area (including fly-over species) over a 30-minute period.

2.5.2.2. Diurnal Active Search

An active search was undertaken within the study area by an ecologist on 28 and 30 January 2020. The survey targeted areas containing *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark) that had a diameter at breast height greater than 10 cm., 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 or scats.

2.5.2.3. Microchiropteran Bat Surveys

Microbat surveys were undertaken in the study area using ultrasonic call detection. Two Song Meter SM2 units were placed in proximity to areas of the most suitable microbat habitat within the study area and were left for two nights between 28 and 30 January 2020 to record microbat activity. The calls were analysed, and species identified by Dr Anna McConville of Echo Ecology and Surveying.

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 067105 – Richmond RAAF) during the field survey is provided in **Table 3**.

Table 3 Weather conditions during field surveys

Date	Temperature Minimum (°C)	Temperature Maximum (°C)	Rainfall (mm)
23 January 2020	17.1	42.4	0
28 January 2020	24.1	37.9	0
29 January 2020	22.7	31.8	0.4
30 January 2020	18.0	34.6	0
17 February 2020	20.5	25.4	0.2

2.7. Biodiversity Assessment Method Calculator

Within the BAMC, the following selections were made in addition to the standard requirements:

- The assessment type was selected as 'Major Projects' as there is currently no option to select a Streamlined Assessment Module – small area development version. As a consequence, this has allowed the assessment of more than one PCT, as typically small area versions only assess the dominant PCT. Given that the dominant PCT comprises planted vegetation and that the remaining PCT comprises a TEC, these two PCTs have been assessed individually within the BAMC.
- The confirmed candidate species field was selected as 'No' based on the assessment provided in ***Section 5.3***.

3. Landscape Features

3.1. Assessment Area

The subject land is approximately 1.43 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 807 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. No mapped watercourses occur within the subject land, however numerous watercourses occur within the assessment area. In addition to the Hawkesbury 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.

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. One mapped area of wetland and associated proximity area under the Coastal Management State Environmental Planning Policy is present within the assessment area, approximately 1.3 km from the subject land. Numerous rural dams occur within the assessment area.

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 Hawkesbury City Council.

The subject land connects to the riparian corridor of the Hawkesbury River via scattered trees above a cleared understorey. Scattered trees also connect the subject land to treed vegetation along Grose Vale Road and Grose River Road, which connects to an intact area of vegetation located along Steading Creek and Phillip Charley Creek located approximately 1.2 km east north east of the subject land. There is limited connectivity east of the Hawkesbury River due to the presence of 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' and 'Hawkesbury - Nepean Channels and Floodplains' 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 Hawkesbury River.

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 807 ha in size, of which approximately 213 ha comprises native vegetation cover, which represents 26% 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 using 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, review of tree data by Australian Tree Consultants (2019) and field surveys. The native vegetation extent within the subject land is shown in **Figure 5**. It occupies approximately 0.18 ha, which represents approximately 13% 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 cleared land, including exotic vegetation and buildings, totalling an area of approximately 1.25 ha. In accordance with Section 5.1.1.5 of the BAM, the areas of cleared land do not require further assessment, unless they are proposed for restoration as part of an offset, or provide habitat for species credit species.

No differences between the aerial photographs using in this assessment and the native vegetation cover shown in **Figure 5** 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 and study area 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.

The analysis determined that the native vegetation within the subject land and study area aligned with two PCTs held within the BioNet Vegetation Classification database. **Table 4** provides a summary of the PCTs identified within the subject land and study area. The distribution of these PCTs within the subject land and study area is shown in **Figure 6**. Detailed descriptions of these PCTs and the justification for PCT selection is provided in the sections below.

Table 4 Plant community types within the subject land and study area

PCT #	PCT Name	Subject Land (ha)	Study Area (ha)
1081	Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	0.12	0.89

PCT #	PCT Name	Subject Land (ha)	Study Area (ha)
1395	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	0.06	0.42
849	Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.00	1.06
-	Exotic Vegetation	0.48	5.68
-	Cleared Land	0.77	1.88
Total*		**1.43**	**9.94**

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

4.2.1. 1081 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion

Vegetation Formation: Dry Sclerophyll Forests (Shrubby sub-formation)

Vegetation Class: Sydney Hinterland Dry Sclerophyll Forests

Percent Cleared Value: 40

TEC Status: Not listed

4.2.1.1. General Description

This community occurs primarily as scattered planted natives over an exotic ground layer. The canopy is characterised by a planted mix of non-endemic native canopy species including *Casuarina cunninghamiana* (River Oak), *Callistemon viminalis* (Weeping Bottlebrush), *Ficus superba* (Deciduous Fig), *Grevillea robusta* (Silky Oak), *Lophostemon confertus* (Brush Box). The shrub layer comprises planted non-endemic natives including *Pittosporum undulatum* (Sweet Pittosporum), *Asplenium australasicum* (Bird's Nest Fern). The ground layer is dominated by the exotic *Stenotaphrum secundatum* (Buffalo Grass) and *Ehrharta erecta*. Other ground layer species include the exotics *Cenchrus clandestinus* (Kikuyu Grass) and *Lolium perenne*, and the natives *Oplismenus aemulus* and *Dichondra repens* (Kidney Weed). An example of this PCT is shown in **Photograph 1**.

4.2.1.2. Condition States

Within the subject land, PCT 1081 exists as one broad condition state. Although there were minor variations observed within this vegetation zone, including areas with a higher proportion of planted native shrubs, one broad condition state has been mapped as these variations were small enough not to warrant a separate vegetation zone.

4.2.1.3. Justification of PCT Selection

Due to the planted nature of the vegetation within the mapped area of this PCT, the vegetation is not considered to comprise a naturally occurring PCT. However, all mapped areas of native vegetation within the subject land are required to be assigned to a best-fit PCT. Although PCT 1395 and PCT 849 were determined

to be present within the subject land (see ***Section 4.2.1.3***), these PCTs was not considered to comprise a best-fit PCT for the planted vegetation. This is due to both PCTs representing a highly cleared vegetation type and therefore would result in a high significance of biodiversity values, which is not reflective of the value of the planted vegetation within the subject land. An alternative PCT was selected by reviewing the mapping of PCTs by OEH (2013) and selecting the closest non-TEC aligned PCT. Due to the planted nature of the vegetation, no species were relied upon for the selection of this PCT.

4.2.1.4. Alignment with Threatened Ecological Communities

Within the BioNet Vegetation Classification, this PCT is not associated with any TECs listed under the BC Act and/or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The vegetation within the subject land has been assessed as not conforming to any TECs.

Photograph 1 PCT 1081 within the study area

4.2.2. 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 80

TEC Status: Critically Endangered Ecology Community (CEEC) – Shale Sandstone Transition Forest

4.2.2.1. General Description

The canopy is characterised by), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark), with scattered occurrences of *Angophora floribunda* (Rough-barked Apple). A shrub layer is absent, and the ground layer is dominated by exotic species. Native ground layer species were sparse and include *Cyperus gracilis* (Slender Flat-sedge), *Einadia nutans* subsp. *linifolia* (Climbing Saltbush), *Einadia trigonos* (Fishweed) and *Dichondra repens* (Kidney Weed). High threat exotic species recorded within this PCT include *Bidens pilosa* (Cobbler's Pegs), *Lonicera japonica* (Japanese Honeysuckle), *Bidens subalternans* (Greater Beggar's Ticks), *Ehrharta erecta* (Panic Veldtgrass), *Araujia sericifera* (Moth Vine), *Ligustrum sinense* (Small-leaved Privet), *Cardiospermum grandiflorum* (Balloon Vine), *Lantana camara* (Lantana), *Lycium ferocissimum* (African Boxthorn), *Phoenix canariensis* (Canary Island Date Palm).

4.2.2.2. Condition States

Within the subject land, PCT 1395 exists as one broad condition state.

4.2.2.3. Justification of PCT Selection

Due to the highly modified nature of the vegetation within this area, the standard process identified in ***Section 4.2*** was expanded to include consideration of mapping and descriptions by OEH (2016), OEH (2013) and Tozer et al. (2010), final determinations, landscape position and soils.

Based on the existing available information of the subject land and surrounds, it was determined that the vegetation within this community would most likely be associated with PCT 849 or PCT 1395. A number of the species recorded within the mapped area overlap between these PCTs and therefore it was not possible to determine the PCT based solely on floristics. An inspection of the soils that the community occurs on was undertaken and found that the soil profile included both shale and sandstone. This soil profile, and the landscape position, being a steep slope resulted in the community being assigned to PCT 1395.

4.2.2.4. Alignment with Threatened Ecological Communities

Within the BioNet Vegetation Classification, this PCT is associated with Shale Sandstone Transition Forest in the Sydney Basin Bioregion, which is listed as a CEEC under the BC Act and EPBC Act. The vegetation within the subject land has been assessed as conforming to the Shale Sandstone Transition Forest TEC.

Photograph 2 PCT 1395 within the study area

4.2.3. 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 93

TEC Status: Critically Endangered Ecology Community (CEEC) – Cumberland Plain Woodland

4.2.3.1. General Description

The canopy is characterised by *Eucalyptus crebra* (Narrow-leaved Ironbark), with scattered occurrences of *Eucalyptus eugenioides* (Thin-leaved Stringybark) and non-endemic *Corymbia citriodora* (Lemon-scented Gum). The shrub layer is sparse with only a few occurrences of native shrubs, including *Acacia parramattensis* (Parramatta Wattle) and *Bursaria spinosa* (Native Blackthorn) and exotic shrubs such as *Lantana camara* (Lantana),. The ground layer is characterised by the native *Aristata ramosa* (Purple Wiregrass), *Cymbopogon refractus* (Barbed Wire Grass) and *Microlaena stipoides* var. *stipoides* (Weeping Grass) and the exotic *Chloris gayana* (Rhodes Grass), *Papalum dilatatum* (Paspalum), *Bidens pilosa* (Cobbler's Pegs) and *Eragrostis curvula*

(African Lovegrass). High threat exotic species recorded within this PCT include *Bidens pilosa,* (Cobbler's Pegs), *Chloris gayana* (Rhodes Grass), *Eragrostis curvula* (African Love Grass), *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet), *Paspalum dilatatum* (Paspalum) and *Senna pendula*.

4.2.3.2. Condition States

Within the subject land, PCT 849 exists as two broad condition states. Each of the condition states are outlined below. None of these patches occur within the subject land.

i. Patch A

Vegetation classified within this zone is of moderate condition and contains remnant and regrowth vegetation. There is a high abundance of native species (16) and a lower number of exotics (7). including species listed as high threat exotics (4). This zone comprises a canopy of *Eucalyptus crebra*, *Eucalyptus eugenioides* and *Eucalyptus tereticornis* with a predominantly native understorey. The community classified as Remnant A is located within the large patch of woodland in the northern portion of the study area along the current access road. An example of this community is shown in **Photograph 3**.

Photograph 3 PCT 849 (Patch A) within the study area

ii. Patch B

This patch of vegetation is dominated by planted native trees including *Eucalyptus crebra* and *Corymbia citriodora*. The ground layer consists of a mix of native and exotic grasses. An example of this community is shown in **Photograph 4**.

Photograph 4 PCT 849 (Patch B) within the study area

4.2.3.3. Justification of PCT Selection

Due to the modified nature of the vegetation within this area, the standard process identified in ***Section 4.2*** was expanded to include consideration of mapping and descriptions by OEH (2016), OEH (2013) and Tozer et al. (2010), final determinations, landscape position and soils.

Based on the existing available information of the subject land and surrounds, it was determined that the vegetation within this community would most likely be associated with PCT 849 or PCT 1395. A number of the species recorded within the mapped area overlap between these PCTs and therefore it was not possible to determine the PCT based solely on floristics. An inspection of the soils that the community occurs on was undertaken and found that the soil profile comprised shale on an undulating hill. This soil profile, and the landscape position resulted in the community being assigned to PCT 849.

Species considered in the assessment included: *Aristida ramosa, Aristida vagans, Bursaria spinosa, Cymbopogon refractus, Dichondra repens, Lomandra multiflora, Microlaena stipoides*.

4.2.3.4. Alignment with Threatened Ecological Communities

Within the BioNet Vegetation Classification, this PCT is associated with Cumberland Plain Woodland in the Sydney Basin Bioregion, which is listed as a CEEC under the BC Act and EPBC Act. The vegetation within the subject land has been assessed as conforming to the Cumberland Plain Woodland TEC.

4.3. Threatened Ecological Communities

Two PCT identified within the subject land has been assessed as being associated with a TEC. **Table 5** summarises the TECs identified within the subject land and their distribution is shown in **Figure 7**.

Table 5 Threatened ecological communities within the subject land and study area

TEC Name	BC Act Status	Associated PCTs	Subject Land (ha)	Study Area (ha)
Shale Sandstone Transition Forest	CEEC	1081: Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	0.06	0.42
Cumberland Plain Woodland	CEEC	849: Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	0.00	1.06

4.4. 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 8**.

Each vegetation zone was assessed using survey plots/transects (see ***Section 2.3.2***) to determine the vegetation integrity score. Plot/transect data utilised to determine the vegetation integrity score is provided in **Appendix A**.

Vegetation zones, patch sizes and vegetation integrity scores for the subject land are summarised in **Table 6**.

Table 6 Vegetation zones within the subject land

Vegetation Zone	PCT#	PCT Name	Condition Name	Area (ha)	Patch Size Class	Vegetation Integrity Score
1	1081	Red Bloodwood – Grey Gum woodland on the edges of the	Planted	0.12	>101	4.4 (Composition: 7.6 Structure: 5.1 Function: 2.2)

Vegetation Zone	PCT#	PCT Name	Condition Name	Area (ha)	Patch Size Class	Vegetation Integrity Score
		Cumberland Plain, Sydney Basin Bioregion				
2	1395	Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Remnant	0.06	>101	29.5 (Composition: 11.5 Structure: 30.2 Function: 73.5)

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: 1081 and 1395;
- Percent native vegetation cover in the assessment area: 26%;
- Patch size: >101 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAMC generated a list of 30 ecosystem credit species and 57 species credit species. These totals include 14 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 7 lists the predicted ecosystem 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. All ecosystem species have been retained in the assessment.

Table 7 Ecosystem credit species requiring further assessment

Scientific Name	Common Name	Sensitivity to Gain Class	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
Anthochaera phrygia	Regent Honeyeater (foraging)	High	1081, 1395	Yes	-
Artamus cyanopterus	Dusky Woodswallow	Moderate	1081, 1395	Yes	-
Callocephalon fimbriatum	Gang-gang Cockatoo (foraging)	Moderate	1081, 1395	Yes	-
Calyptorhynchus lathami	Glossy Black-Cockatoo (foraging)	High	1081, 1395	Yes	-
Chthonicola sagittata	Speckled Warbler	High	1395	Yes	-
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	High	1081, 1395	Yes	-
Daphoenositta chrysoptera	Varied Sittella	Moderate	1081, 1395	Yes	-
Dasyurus maculatus	Spotted-tailed Quoll	High	1081, 1395	Yes	-
Glossopsitta pusilla	Little Lorikeet	High	1081, 1395	Yes	-
Grantiella picta	Painted Honeyeater	Moderate	1081, 1395	Yes	-
Haliaeetus leucogaster	White-bellied Sea-Eagle (foraging)	High	1395	Yes	-
Hieraaetus morphnoides	Little Eagle (foraging)	Moderate	1081, 1395	Yes	-
Lathamus discolor	Swift Parrot (foraging)	Moderate	1081, 1395	Yes	-
Lophoictinia isura	Square-tailed Kite (foraging)	Moderate	1081, 1395	Yes	-
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Moderate	1081, 1395	Yes	-
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Moderate	1081, 1395	Yes	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	1081, 1395	Yes	-
Miniopterus australis	Little Bent-winged Bat (foraging)	High	1081, 1395	Yes	-
Miniopterus orianae oceanensis	Large Bent-winged Bat (foraging)	High	1081, 1395	Yes	-

Scientific Name	Common Name	Sensitivity to Gain Class	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
Neophema pulchella	Turquoise Parrot	High	1081, 1395	Yes	-
Ninox connivens	Barking Owl (foraging)	High	1081, 1395	Yes	-
Ninox strenua	Powerful Owl (foraging)	High	1081, 1395	Yes	-
Petroica boodang	Scarlet Robin	Moderate	1081, 1395	Yes	-
Petroica phoenicea	Flame Robin	Moderate	1395	Yes	-
Phascolarctos cinereus	Koala (foraging)	High	1081, 1395	Yes	-
Pteropus poliocephalus	Grey-headed Flying-fox (foraging)	High	1081, 1395	Yes	-
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	High	1081, 1395	Yes	-
Stagonopleura guttata	Diamond Firetail	Moderate	1081, 1395	Yes	-
Tyto novaehollandiae	Masked Owl (foraging)	High	1081, 1395	Yes	-
Varanus rosenbergi	Rosenberg's Goanna	High	1081, 1395	Yes	-

5.3. Species Credit Species

Table 8 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.

A total of 34 flora species and 23 fauna species have been predicted for the subject land. Of these, 17 flora species and seven 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 8 Species credit species requiring further assessment

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
Flora					
Acacia bynoeana	Bynoe's Wattle	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Acacia gordonii	-	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Acacia prominens – endangered population	Gosford Wattle, Hurstville and Kogarah Local Government Areas	Moderate	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Acacia pubescens	Downy Wattle	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Allocasuarina glareicola	-	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Caladenia tessellata	Thick Lip Spider Orchid	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
					within the very high sensitivity to gain class due to negligible impacts.
Callistemon linearifolius	Nettled Bottle Brush	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Darwinia biflora	-	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Deyeuxia appressa	-	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Dillwynia tenuifolia	-	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Dillwynia tenuifolia **–** endangered population	*Dillwynia tenuifolia* – endangered population Dillwynia tenuifolia, Kemps Creek	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Epacris purpurascens var. purpurascens		Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
					within the very high sensitivity to gain class due to negligible impacts.
Eucalyptus sp. Cattai	-	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Grevillea parviflora subs. parviflora	Small-flower Grevillea	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Grevillea parviflora subsp. supplicans	-	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Gyrostemon thesioides	-	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Hibbertia puberula	-	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Hibbertia spanantha	-	High	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
					within the very high sensitivity to gain class due to negligible impacts.
Hibbertia superans	-	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Lasiopetalum joyceae	-	Moderate	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Leucopogon exolasius	Woronora Beard Heath	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Leucopogon fletcheri subsp. fletcheri	-	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Marsdenia viridiflora subsp. viridiflora – endangered population	Marsdenia viridiflora R. Br. Subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd,	Moderate	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
	Liverpool and Penrith local government areas				
Melaleuca deanei	Deane's Paperbark	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Persoonia bargoensis	Bargo Geebung	High	1081,1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Persoonia glaucescens	Mittagong Geebung	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Persoonia hirsuta	Hairy Geebung	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Persoonia nutans	Nodding Geebung	Moderate	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Pimelea curviflora var. curviflora	-	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
					within the very high sensitivity to gain class due to negligible impacts.
Pomaderris brunnea	Brown Pomaderris	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Pterostylis saxicola	Sydney Plains Greenhood	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Pultenaea pedunculata	Matted Bush-pea	High	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Tetratheca glandulosa	-	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Wahlenbergia multicaulis – endangered population	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	High	1081	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
Fauna					
Anthochaera phrygia	Regent Honeyeater (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Burhinus grallarius	Bush-stone Curlew	High	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Callocephalon fimbriatum	Gang-gang Cockatoo (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Calyptorhynchus lathami	Glossy Black-Cockatoo (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Cercartetus nanus	Eastern Pygmy-possum	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Chalinolobus dwyeri	Large-eared Pied Bat	Very High	1081, 1395	No	Habitat constraint absent from the subject land – i.e. not within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
Haliaeetus leucogaster	White-bellied Sea-Eagle (breeding)	High	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Hieraaetus morphnoides	Little Eagle (breeding)	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Lathamus discolor	Swift Parrot (breeding)	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Litoria aurea	Green and Golden Bell Frog	High	1081,1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Lophoictinia isura	Square-tailed Kite (breeding)	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Meridolum corneovirens	Cumberland Plain Land Snail	High	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
Miniopterus australis	Little Bent-winged Bat (breeding)	Very High	1081, 1395	No	Habitat constraint absent from the subject land – i.e. caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding absent.
Miniopterus orianae oceanensis	Large Bent-winged Bat (breeding)	Very High	1081, 1395	No	Habitat constraint absent from the subject land – i.e. caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding absent.
Myotis macropus	Southern Myotis	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Ninox connivens	Barking Owl (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Ninox strenua	Powerful Owl (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Petaurus norfolcensis	Squirrel Glider	High	1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Phascolarctos cinereus	Koala (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment?	Justification if Not Retained
					within the very high sensitivity to gain class due to negligible impacts.
Pommerhelix duralensis	Dural Land Snail	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Pseudophryne australis	Red-crowned Toadlet	Moderate	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Pteropus poliocephalus	Grey-headed Flying-fox (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.
Tyto novaehollandiae	Masked Owl (breeding)	High	1081, 1395	No	Streamlined Assessment Module - small area developments does not require further assessment for species that are not within the very high sensitivity to gain class due to negligible impacts.

5.3.1. Presence of Candidate Species Credit Species

5.3.1.1. Surveys

No predicted threatened flora and fauna species were assessed as candidate species credit species requiring further assessment (see ***Section 5.3***), therefore no targeted threatened flora and fauna surveys were required to be undertaken within the subject land. Notwithstanding this, some targeted threatened flora and fauna surveys were undertaken within the subject land, as described in ***Section 2.4*** and ***Section 2.5***.

5.3.1.2. Expert Report

This assessment has not utilised any expert reports.

5.3.1.3. Candidate Species Occurrence

No candidate species credits species were identified (see ***Section 5.3***). No species credit species were detected within the subject land during surveys.

5.3.1.4. Non-candidate Species

Calls for the following threatened bat species were recorded within the study area:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*); and
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

These species comprise ecosystem credit species and have been assessed accordingly.

5.3.2. Extent of Habitat

No species credit species have been assessed as present within the subject land and therefore no extent of habitat has been identified.

5.4. 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;
    - 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
- 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 9**. The location of prescribed impacts is shown in **Figure 9**.

Table 9 Relevance of prescribed impacts

Prescribed Impact	Relevance to the Project
Karst, caves, crevices, cliffs, rock outcrops and other geological features of significance	Not relevant. Features are not present within the subject land.
Human-made structures	The project includes the staged demolition of a number of existing buildings within the subject land.
Non-native vegetation	Non-native vegetation occurring within the subject land is likely to provide habitat for native fauna species, including threatened birds and bats.
Habitat connectivity	The native and non-native vegetation within the subject land connects to the riparian corridor of the Hawkesbury River via scattered trees above a cleared understorey. Scattered trees also connect the subject land to treed vegetation along Grose Vale Road and Grose River Road, which connects to an intact area of vegetation located along Steading Creek and Phillip Charley Creek located approximately 1.2 km east north east of the subject land.
Waterbodies, water quality and hydrological processes	Not relevant. Features not present within the subject land.
Wind turbine strikes	Not relevant. Project does not comprise a wind farm development.
Vehicle strikes	Not relevant. Although the project includes the construction of accessways to buildings, vehicle movement in these areas are limited and no impacts to threatened species are predicted.

6. Avoid and Minimise Impacts

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

6.1.1. Project Location

The development footprint has been situated within the study area to allow for the construction and operational requirements of the project while minimising impacts to areas containing biodiversity values. In determining the location of the development footprint, the project has sought to avoid and minimise direct impacts on native vegetation and habitat by:

- Locating the project within areas previously comprising buildings, exotic vegetation and planted vegetation;
- Retaining existing vehicle access routes;
- Removing proposed garden areas proposed to be located within Shale Sandstone Transition Forest TEC;
- Relocating the Wellness Centre, thus minimising the impact to Shale Sandstone Transition Forest TEC;
- Retaining areas of native vegetation, comprising PCT 1081 and PCT 1395;
- Avoiding all areas of Cumberland Plain Woodland TEC;
- Retaining vegetation with the highest vegetation integrity score within the study area (patch at the north western end of the study area); and
- Maintaining habitat connectivity through retention of trees across the study area.

6.1.2. Project Design

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

- Redesigning buildings to reduce the BAL rating and subsequently APZ requirements, which has minimised the impact to TEC vegetation;
- Utilising existing infrastructure to avoid requirement to install additional ancillary features within native vegetation; and
- Avoiding the use of bulk earthworks across the study area so as to retain areas of native vegetation; and
- Incorporating landscaping into the project to maintain habitat connectivity.

6.2. Avoid and Minimise Prescribed Impacts

Man-made structures, non-native vegetation and habitat connectivity has been identified as a prescribed impact for the project. In determining the location and design of the development footprint, the project has sought to avoid and minimise direct impacts of these prescribed impacts by:

- Staging demolition of man-made structures;
- Retaining areas of non-native vegetation, including mature canopy trees;
- Maintaining connectivity with the scattered trees and remnant vegetation within the study area, in particular to adjoining areas of TEC vegetation;
- Maintaining habitat connectivity through retention of trees across the study area; and
- Incorporating landscaping into the project to maintain habitat connectivity.

7. Assessment of Impacts

7.1. Direct Impacts

The direct impact resulting from the proposed development is the loss of vegetation within the subject land. **Table 10** identifies the extent of impacts to vegetation within the subject land.

Table 10 Extent of vegetation impacts within the subject land

Vegetation Zone	PCT #	PCT Name	BC Act Status	Subject Land (ha)
1	1081	Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	-	0.12
2	1395	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	CEEC	0.06
-	-	Exotic Vegetation	-	0.48
-	-	Cleared Land	-	0.77
Total				**1.43**

7.2. Change in Vegetation Integrity Score

Table 11 details the change in vegetation integrity score for each vegetation zone and management zone. The following management zones are relevant to the project:

To reflect the intended development of the subject land, which includes areas of complete clearing and areas of APZ management, two management zone types have been delineated. This includes:

- Clearing: represented by complete clearing; and
- APZ: represented by the ongoing maintenance of vegetation to fulfil APZ requirements.

For the clearing management zone, the future vegetation integrity scores have been reduced to 0. Is it noted that some areas of clearing overlap with the APZ, however as these areas are to be removed as part of construction works they have been allocated to the clearing management zone.

For the APZ management zone, the future vegetation integrity scores have been modified as follows:

- Future tree cover reduced to 20% cover, to account for potential tree trimming;
- Future litter cover reduced to 0%, to account for management of fuel loads;
- Future coarse woody debris cover reduced to 0 m, to account for management of fuel loads; and
- Future regeneration reduced to 'absent' due to management of regeneration.

All other values have been retained as per current scores, as minimal future management is required, due to the current condition of the vegetation.

Table 11 Change in vegetation integrity score

Vegetation Zone	PCT Name	Management Zone	Area (ha)	Current VI Score	Future VI Score	Change in VI Score	Total Change in VI Score
1	1081: Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	1_Clearing	0.12*	4.4	0	-4.4	-4.4
2	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	1_Clearing	0.01^	29.5	0	-29.5	-13.8
		2_APZ	0.05+	29.5	18.8	-10.7	

** Value includes a very small area (0.001 ha) of this vegetation zone occurs within the APZ. An APZ management zone has not been included as the BAMC does not allow values to 3 decimal places to be entered.*

^ Value rounded up (from 0.0042 ha) to ensure sum of management zone areas matches the vegetation zone total.

+ Value rounded down (from 0.0536 ha) to ensure sum of management zone areas matches the vegetation zone total.

7.3. Indirect Impacts

Table 12 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 12 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 within study area.	Short term (during construction)	Shale Sandstone Transition Forest	Reduced condition of the adjoining TEC.
Reduced viability of adjacent habitat due to edge effects	Modification of vegetation extent within the subject land may increase edge effects.	Retained vegetation within study area.	Potential long-term	Shale Sandstone Transition Forest	Reduced condition of the adjoining TEC.
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 within study area.	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 retained vegetation.	Retained vegetation within study area.	Potential long-term	Shale Sandstone Transition Forest	Reduced condition of the adjoining TEC.
Loss of breeding habitats	Hollow-bearing trees may be modified within the APZ for the project.	Vegetation Zone 2.	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 outside of the subject land.

7.4. Prescribed Impacts

The project has been assessed as resulting in three prescribed impacts (see ***Section 5.4***). An assessment of these prescribed impacts is provided below.

7.4.1. Human-made Structures

7.4.1.1. Nature

The project has been designed and sited to maximise avoidance of native vegetation and subsequently existing human-made structures are proposed to be demolished for the project.

7.4.1.2. Extent

The proposed development will impact a total of 0.66 ha of cleared land including buildings and hard stand areas.

7.4.1.3. Duration

The removal of the human-made structures is considered to be a long-term impact, however these impacts will be staged during the project to allow for ongoing use of some buildings whist others are under construction.

7.4.1.4. 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.

7.4.1.5. Consequences

The project will result in a very minor reduction in human-made structures by 0.66 ha. The reduction of this small area of structures is not considered to significantly impact upon threatened entities.

7.4.2. Non-native Vegetation

7.4.2.1. Nature

The project has been designed and sited to maximise avoidance of native vegetation and subsequently non-native vegetation is proposed to be cleared for the project. Non-native vegetation includes areas of exotic grassland and planted exotic trees and shrubs.

7.4.2.2. Extent

The proposed development will clear a total of 0.45 ha of exotic vegetation.

7.4.2.3. Duration

The removal of the non-native vegetation is considered to be a long-term impact.

7.4.2.4. Threatened Entities Affected

The habitat provided by non-native vegetation may provide foraging and/or nesting/roosting habitat for ecosystem species, such as microchiropteran bats and birds.

7.4.2.5. Consequences

The project will result in a very minor reduction in non-native vegetation by 0.45 ha. The reduction of this small area of habitat is not considered to significantly impact upon the potentially affected threatened entities as other areas of suitable habitat, in the form of both native and non-native vegetation will be retained by the project.

7.4.3. Habitat Connectivity

7.4.3.1. Nature

The native and non-native vegetation within the subject land connects to the riparian corridor of the Hawkesbury River via scattered trees above a cleared understorey. Scattered trees also connect the subject land to treed vegetation along Grose Vale Road and Grose River Road, which connects to an intact area of vegetation located along Steading Creek and Phillip Charley Creek located approximately 1.2 km east north east of the subject land. The vegetation within the subject land forms part of a patch of native vegetation that is approximately >101 ha in size. The patch size is large due to stepping-stone connectivity to riparian corridors.

7.4.3.2. Extent

Habitat connectivity will be marginally reduced by the removal of 0.53 ha of vegetation, including 0.004 ha of TEC vegetation, 0.12 ha of planted native vegetation and 0.41 ha of exotic vegetation. A further 0.12 ha of vegetation will be managed as an APZ, including 0.05 ha of TEC vegetation, 0.001 ha of planted native vegetation and 0.07 ha of exotic vegetation.

7.4.3.3. Duration

The reduction of habitat connectivity is considered to be a long-term impact.

7.4.3.4. Threatened Entities Affected

The stepping-stone habitat provided by the subject land may provide connectivity for ecosystem species, such as the Grey-headed Flying-fox and microchiropteran bats.

7.4.3.5. Consequences

The project will result in the reduction in stepping-stone habitat by 0.53 ha and modification of a further 0.12 ha. The reduction of this small area of habitat is not considered to significantly impact the movement of mobile fauna species. 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). 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.

7.5. Mitigation of Impacts to Native Vegetation and Habitat

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 13**.

7.5.1. Weed Management

In order to minimise the spread of weeds throughout the subject land and adjoining areas, appropriate weed control activities will be undertaken prior to vegetation clearing in accordance with the Greater Sydney Local Land Services Area and is subject to the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2019) under the NSW *Biosecurity Act 2015*.

The *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 (LLS: Greater Sydney 2019). In order to comply with the objectives of the Greater Sydney Regional Strategic Weed Management Plan, it is recommended the following measures be implemented as part of weed management for the subject land.

i. Prevention

Appropriate construction site hygiene measures will be implemented to prevent entry of new weeds to the area such as the cleaning of equipment prior to entering the subject land.

ii. Eradication

Initial weed management will be carried out within the study area according to best-practice methods under the direction of a suitably qualified bush regenerator. The targeted species will be those listed under Appendices 1 and 2 of the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (LLS: Greater Sydney 2019). Initial weed treatment will include eliminating woody species and targeting large dominant infestations of exotic herbs. This may be achieved via a combination of manual weed removal and herbicide use.

Best-practice bush regeneration should undertake measures to avoid adverse impacts to retained vegetation within the study area, including not over clearing (remove only targeted species), employment of minimal disturbance techniques to avoid soil and surrounding vegetation disturbance, and replacement of disturbed mulch/leaf-litter.

iii. Containment

Follow-up monitoring and maintenance should be undertaken in the study area following vegetation clearing activities, to contain any re-emergence of weed species.

7.5.2. Delineation of Clearing Limits

The current limits of clearing will be marked either by high visibility tape on trees or metal/wooden pickets, fencing or an equivalent boundary marker that will be installed prior to clearing. To avoid unnecessary or inadvertent vegetation and habitat removal or impacts on fauna, disturbance must be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary.

7.5.3. Tree Protection Measures

Trees retained within the study area will be subject to tree protection measures detailed within the aboricultural assessment for the project. This includes:

- Inductions to communicate tree protection measures;
- Installation of fences around specified tree protection zones; and
- All tree work is to be carried out by a suitably qualified and insured Arborist.

7.5.4. Pre-clearance Surveys

In order to minimise impacts to fauna species during construction, 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 activities by a qualified ecologist.

Habitat features to be identified include:

- Hollow-bearing trees;
- Hollow-bearing logs; and
- Nests within tree canopy or shrubs.

Such features have the potential to contain native species. All habitat features will be identified, recorded and flagged with fluorescent marking tape and trees will have an "H" spray painted with marking paint on two sides of the tree.

7.5.5. 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 (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanised).

Provision of a report following the completion of clearing works will be provided detailing the total number and species of individuals recorded and details of their release/health.

7.5.6. Sedimentation Control Measures

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.

Table 13 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
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 2019).	Construction	Prior to construction, following vegetation clearing	Contractor	High	Spread of weeds throughout the study area and surrounding land.
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.
Tree protection measures	Inductions to communication tree protection measures. Installation of fences around specified tree protection zones. All tree work is to be carried out by a suitably qualified and insured Arborist.	Construction	Throughout construction period	Contractor	High	Unnecessary damage to trees to be retained.
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.

Mitigation Measure	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Risk and Consequences of Residual Impacts
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 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)	Construction	Once	Contractor	High	Increased and unnecessary mortality of native fauna.
Sedimentation 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.

7.6. Mitigation of Prescribed Impacts

The following mitigation measures, described in ***Section 7.3***, are relevant to the prescribed impacts relevant to the project:

- Delineation of clearing limits;
- Pre-clearance survey; and
- Staging of clearing.

No additional mitigation measures are proposed for prescribed impacts.

7.7. Adaptive Management for Uncertain Impacts

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

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

Due to the small scale of indirect and prescribed impacts, the project does not propose to use additional biodiversity credits to mitigate or offset these impacts.

8. Thresholds for Assessment

8.1. 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.

8.2. Impacts on Serious and Irreversible Impact Entities

One SAII entity, Shale Sandstone Transition Forest, will be impacted by the project. The location of the Shale Sandstone Transition Forest in relation to the development footprint is shown in **Figure 8**. Approximately 0.06 ha of Shale Sandstone Transition Forest will be impacted within the subject land, including 0.004 ha proposed for clearing and 0.054 ha proposed to be managed within an APZ (largely in its current condition).

It is noted that Cumberland Plain Woodland is also an SAII entity, however this community is not being impacted by the project and therefore an additional assessment is not provided.

Section 10.2.2 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 are shown as italicised text below, with responses supplied beneath in plain text. The information presented below indicates that the project is unlikely to result in a significant and irreversibly impact to the TEC.

(a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

The actions and measures taken to avoid impacts to Shale Sandstone Transition Forest include amendments to the location of building footprints, amending the design of buildings to reduce APZ requirements, removal of managed gardens within the TEC, and wholly containing construction disturbance to within the development footprint or cleared land. Mitigation measures proposed to be undertaken during construction have also been designed to minimise indirect impacts to the retained area of Shale Sandstone Transition Forest within the study area.

(b) the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone

Approximately 0.06 ha of Shale Sandstone Transition Forest will be impacted within the subject land. A further 0.36 ha will remain within the study area, which is located in proximity to the subject land and may be indirectly impacted by the project. Within the subject land, the Shale Sandstone Transition Forest has a current vegetation integrity score of 29.5. As the BAM plot undertaken for Shale Sandstone Transition Forest overlaps between vegetation to be impacted within the subject land and vegetation to be indirectly impacted within

the study area, the vegetation integrity score of 29.5 is also considered to be representative of areas that will be indirectly impacted within the study area by the project.

(c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact

There is currently no defined threshold for this SAII entity. No thresholds are currently defined for TECs within the Sydney Basin IBRA bioregion and Cumberland Ecology understands that the EES does not intend to determine any of these thresholds at the current time.

(d) the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint

Within an area of 1,000 ha surrounding the subject land, approximately 117 ha of Shale Sandstone Transition Forest is mapped as occurring. This was derived using the broad scale vegetation mapping for the Shale Sandstone Transition Forest mapped by OEH (2013) and the Sydney Metropolitan Area mapped by OEH (2016). The condition of Shale Sandstone Transition Forest within an area of 1,000 ha surrounding the subject land is expected to be in a similar condition to that within the subject land and study area, with variation of condition existing within these areas.

Within an area of 10,000 ha surrounding the subject land, approximately 1,320 ha of Shale Sandstone Transition Forest has been mapped. This was derived using the aforementioned mapping clipped to include a 10,000 ha area surrounding the centre of the subject land. The condition of Shale Sandstone Transition Forest within an area of 10,000 ha surrounding the subject land is likely to be variable, with occurrence of intact high quality remnants and areas containing degraded remnants with only scattered trees. The extent of Shale Sandstone Transition Forest within an area of 10,000 ha surrounding the subject land is shown in **Figure 10**.

(e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration

Approximately 14,025 ha of Shale Sandstone Transition Forest is mapped as occurring within the Cumberland IBRA subregion. This value is derived from mapped areas included within OEH (2013), OEH (2016) and Tozer et al. (2010). The project will result in the removal or modification of approximately 0.06 ha of Shale Sandstone Transition Forest within the subject land, which represents 0.0004% of the extent within the Cumberland IBRA subregion. The current extent of Shale Sandstone Transition Forest amounts to 20-40% of the original distribution (NSW Scientific Committee 2014). The condition of Shale Sandstone Transition Forest has been reduced by a number of threats including urban development, inappropriate fire regimes, anthropogenic climate change, removal of wood, physical damage from recreational activities, rubbish dumping, grazing, mowing and weed invasion. The overall condition of Shale Sandstone Transition Forest across the Sydney Basin bioregion is unlikely to change as a result of the project, as the condition present within the subject land is highly modified, and reflects the dominant condition of the community through its current extent.

(f) an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion

A total of approximately 14,025 ha of Shale Sandstone Transition Forest occurs within the Cumberland IBRA subregion, of which approximately 364 ha occurs in the reserve system.

A total of approximately 21,301 ha of Shale Sandstone Transition Forest occurs within the Sydney Basin IBRA bioregion, of which approximately 556 ha occurs in the reserve system.

(g) the development, clearing or biodiversity certification proposal's impact on:

> *(i) abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns*

The project will not involve changes to groundwater levels, surface water patterns and soil disturbance that would impact the Shale Sandstone Transition Forest that will be retained within the study area. The project is unlikely to have any impact on abiotic factors critical to the long-term survival of the TEC, both within the study area and adjoining areas.

> *(ii) characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants*

The project will result in the removal or modification of 0.06 ha of Shale Sandstone Transition Forest, comprising an area of canopy trees above a highly disturbed understorey. Within the subject land, a substantial change will occur to 0.004 ha where the composition of the community will be entirely removed. Within the building envelopes, this includes the removal of one *Eucalyptus tereticornis* (Forest Red Gum), as well as understorey species. A small change will occur within 0.054 ha within the APZ, where only canopy trimming is proposed.

> *(iii) the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC*

The Shale Sandstone Transition Forest within the subject land has previously been modified as a result of previous clearing and ongoing. A suite of invasive flora species, including high threat exotics, are known to occur within this community within the subject land, and there is the potential for an increase of such species in areas of retained Shale Sandstone Transition Forest if left unmitigated due to changing land uses and management. The project is considered unlikely to result in the regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in areas of retained Shale Sandstone Transition Forest. The quality and integrity of the remaining areas of the TEC surrounding the subject land is unlikely to be significantly impacted, due to the modified nature of the surrounding vegetation.

(h) direct or indirect fragmentation and isolation of an important area of the potential TEC

Shale Sandstone Transition Forest is considered to be one of the most fragmented vegetation types in the Sydney region, with an estimated 1115 km of interface with cleared or degraded land, and a high proportion of remnants (90%) are mostly very small (>10 ha) (NSW Scientific Committee 2014). The removal or modification of 0.06 ha of Shale Sandstone Transition Forest will not significantly increase fragmentation or isolation of an important area of the TEC, as it predominantly requires clearing at the edge of treed habitat, rather than creating fragmented habitat patches. Some fragmentation will occur between isolated planted native trees, including scattered trees in the surrounding landscape. Although the project will increase the amount of overall fragmentation, it will not result in the isolation of important areas of habitat.

(i) the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

Mitigation measures to be implemented for the project will assist in minimising potential impacts to retained Shale Sandstone Transition Forest within the study area. Biodiversity offsets as determined by the BAM are proposed to be purchased within the IBRA subregion or surrounding subregions, in accordance with the offsetting rules under the BAM, that will contribute to the recovery of Shale Sandstone Transition Forest in the surrounding landscape.

8.3. Impacts that Require an Offset

8.3.1. Native Vegetation

In accordance with the BAM, the project requires offsets for the clearing of native vegetation as the following criteria is 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 zone requiring offsets is documented in **Table 14**. This area is mapped in **Figure 11**.

Table 14 Summary of impacts to native vegetation requiring an offset

Vegetation Zone	PCT #	PCT Name	Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Score	Total Change in Vegetation Integrity Score
2	1395	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	0.06	29.5	0 (Cleared) 18.8 (APZ)	-29.5 (Cleared) -10.7 (APZ)	-13.8

8.3.2. Threatened Species

No threatened species are required to be offset.

8.4. Impacts that do not Require an Offset

In accordance with the BAM, the project does not require offsets for the clearing of native vegetation as the following criteria is met:

- A vegetation zone that has a vegetation integrity score of <17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or is representative of a vulnerable ecological community.

The PCT and vegetation zone not requiring offsets is documented in **Table 15**. This area is mapped in **Figure 11**. Due to the low (4.4) vegetation integrity score of Vegetation Zone 1, an offset is not required.

Table 15 Summary of impacts to native vegetation not requiring an offset

Vegetation Zone	PCT #	PCT Name	Area (ha)	Vegetation Integrity Score
1	1081	Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion	0.12	4.4

8.5. 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 1.25 ha, and comprise all unmapped areas on **Figure 11**.

8.6. 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 ecosystem credit requirement for the project is summarised in **Table 16**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 17**.

A credit summary report from the BAMC 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 16 Summary of ecosystem credit liability

PCT #	PCT Name	TEC	Area (ha)	Credits Required
1395	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	0.06	1

Table 17 Like for like offsetting options for PCT 1395

Any PCT with the below TEC	Containing Hollow-bearing Trees?	In the below IBRA Subregions
Shale Sandstone Transition Forest in the Sydney Basin Bioregion This includes PCT's: 792, 1281, 1395	Yes	Cumberland , Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

9. References

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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	1081	0.12	101	Zone_1_Planted	2	0	1	3	0	0	13.0	0.0	0.1	0.4	0.0	0.0	0	0	3.4	0.0	0	0	0	1	0	0	58.0
2	1395	0.06	101	Zone_2_Remnant	3	1	1	3	0	0	35.2	0.5	0.5	0.5	0.0	0.0	4	4	28.0	4.5	0	0	1	1	1	1	28.7

BAM Site – Field Survey Form	Site Sheet #: 1 of 2

		Survey Name		Plot Identifier		Recorders		
Date	23/01/2020	19166		Q1		RM, MP		
Zone 56	Datum GDA94	IBRA region	Sydney Basin		Photo #	1-4	Zone ID	1
Easting 286 677	Northing 6 280 533	Dimensions	20m x 50m		Orientation of midline from the 0 m point.	300°		
Vegetation Class		Sydney Hinterland Dry Sclerophyll Forests					Confidence: H M L	
Plant Community Type		1081: Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion			TEC: No		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	0
	Grasses etc.	1
	Forbs	3
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	13.0
	Shrubs	0.0
	Grasses etc.	0.1
	Forbs	0.4
	Ferns	0.0
	Other	0.0
High Threat Weed cover		58.0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	0	-
50 – 79 cm	0	-
30 – 49 cm	2	0
20 – 29 cm	0	-
10 – 19 cm	0	-
5 – 9 cm	0	-
< 5 cm	0	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	Absent	Total = 0

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	2	5	5	0	5	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	3.4																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

BAM Site – Field Survey Form	Site Sheet #: 2 of 2

		Survey Name		Plot Identifier		Recorders			
Date	23/01/2020	19166		Q1		RM, MP			
Zone 56	Datum GDA94	IBRA region	Sydney Basin		Photo #	1-4	Zone ID	1	
Easting 286 677	Northing 6 280 533	Dimensions	20m x 50m			Orientation of midline from the 0 m point.	300°		
Vegetation Class		Sydney Hinterland Dry Sclerophyll Forests						Confidence: H M L	
Plant Community Type		1081: Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion				TEC: No		Confidence: H M L	

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
TG	Casuarina cunninghamiana	N	10	1		
TG	Callistemon viminalis	N	3	2		
	Harpephyllum caffrum	E	5	1		
	Pistacia chinensis	HTE	5	1		
	Agave americana	E	10	10		
	Phoenix canariensis	HTE	10	3		
	Cenchrus clandestinus	HTE	1	50		
	Cinnamomum camphora	HTE	0.5	1		
	Passiflora edulis	E	0.1	5		
	Araujia sericifera	HTE	0.5	35		
	Schinus molle	E	5	1		
FG	Einadia trigonos	N	0.2	20		
FG	Oxalis perennans	N	0.1	20		
	Lolium perenne	E	0.1	15		
	Lantana camara	HTE	0.2	5		
	Bidens pilosa	HTE	0.1	10		
	Jacaranda mimosifolia	E	2	4		
	Cupressus glabra	E	5	1		
	Ehrharta erecta	HTE	0.5	50		
FG	Portulaca oleracea	N	0.1	1		
	Conyza sumatrensis	E	0.1	15		
	Paronychia brasiliana	E	0.1	10		
	Celtis australis	E	1	5		
	Lonicera japonica	HTE	0.2	20		
	Stenotaphrum secundatum	HTE	40	4000		
GG	Cyperus gracilis	N	0.1	25		
	Beaucarnea recurvata	E	0.5	4		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.
Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, …, 10, 15, 20, 25, …100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

BAM Site – Field Survey Form	Site Sheet #: 1 of 2

		Survey Name		Plot Identifier		Recorders		
Date	23/01/2020	19166		Q2		RM, MP		
Zone 56	Datum GDA94	IBRA region	Sydney Basin	Photo #	5-8	Zone ID	2	
Easting 286 793	Northing 6 280 370	Dimensions	20m x 50m	Orientation of midline from the 0 m point.	98°			
Vegetation Class		Coastal Valley Grassy Woodlands					Confidence: H M L	
Plant Community Type		1395: Cumberland shale - sandstone Ironbark forest			TEC: Yes		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	3
	Shrubs	1
	Grasses etc.	1
	Forbs	3
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	35.2
	Shrubs	0.5
	Grasses etc.	0.5
	Forbs	0.5
	Ferns	0.0
	Other	0.0
High Threat Weed cover		28.7

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	2	1
50 – 79 cm	2	3
30 – 49 cm	1	0
20 – 29 cm	1	0
10 – 19 cm	0	-
5 – 9 cm	0	-
< 5 cm	1	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2, 1, 1.5	Total = 4.5

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30…, 100, 200, 300…). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	25	40	20	15	40	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	28.0																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

BAM Site – Field Survey Form	Site Sheet #: 2 of 2

		Survey Name	Plot Identifier	Recorders		
Date	23/01/2020	19166	Q2	RM, MP		
Zone 56	Datum GDA94	IBRA region: Sydney Basin	Photo #: 5-8	Zone ID: 2		
Easting 286 793	Northing 6 280 370	Dimensions: 20m x 50m	Orientation of midline from the 0 m point.: 98º			
Vegetation Class	Coastal Valley Grassy Woodlands				Confidence: H M L	
Plant Community Type	1395: Cumberland shale - sandstone Ironbark forest			TEC: Yes	Confidence: H M L	

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
TG	Eucalyptus crebra	N	20	2		
TG	Eucalyptus tereticornis	N	15	2		
	Phoenix canariensis	HTE	0.1	1		
	Lonicera japonica	HTE	10	50		
	Bidens subalternans	HTE	5	500		
	Ehrharta erecta	HTE	2	200		
	Bidens pilosa	HTE	10	100		
	Prunus spp.	E	0.1	10		
	Lycium ferocissimum	HTE	0.2	2		
	Ligustrum sinense	HTE	0.5	10		
	Oxalis latifolia	E	1	100		
	Araujia sericifera	HTE	0.5	20		
	Cardiospermum grandiflorum	HTE	0.2	20		
FG	Einadia trigonos	N	0.2	25		
	Celtis sinensis	E	0.1	2		
FG	Einadia nutans subsp. linifolia	N	0.2	15		
GG	Cyperus gracilis	N	0.5	50		
	Lolium perenne	E	0.5	50		
TG	Angophora floribunda	N	0.2	1		
	Lantana camara	HTE	0.2	5		
SG	Pittosporum undulatum	N	0.5	1		
	Jacaranda mimosifolia	E	0.2	10		
FG	Dichondra repens	N	0.1	15		
	Ulmus procera	E	0.2	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.
Cover: 0.1, 0.2, 0.3, …, 1, 2, 3, …, 10, 15, 20, 25, …100% (foliage cover); ***Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
Abundance: 1, 2, 3, …, 10, 20, 30, … 100, 200, …, 1000, …

APPENDIX B :
BAMC Credit Summary

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00019260/BAAS18010/20/00019261	19166 - SJG Richmond	20/08/2020
Assessor Name	Report Created	BAM Data version *
	09/10/2020	30
Assessor Number	BAM Case Status	Date Finalised
	Finalised	09/10/2020
Assessment Revision	Assessment Type	
0	Major Projects	

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

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

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cumberland shale - sandstone Ironbark forest								
2	1395_Remnant	13.8	0.06	0.25	High Sensitivity to Potential Gain	2.50	TRUE	1
							Subtotal	**1**

Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion								
1	1081_Planted	4.4	0.12	0.25	High Sensitivity to Potential Gain	1.50		0
							Subtotal	**0**
							Total	**1**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits

FIGURES

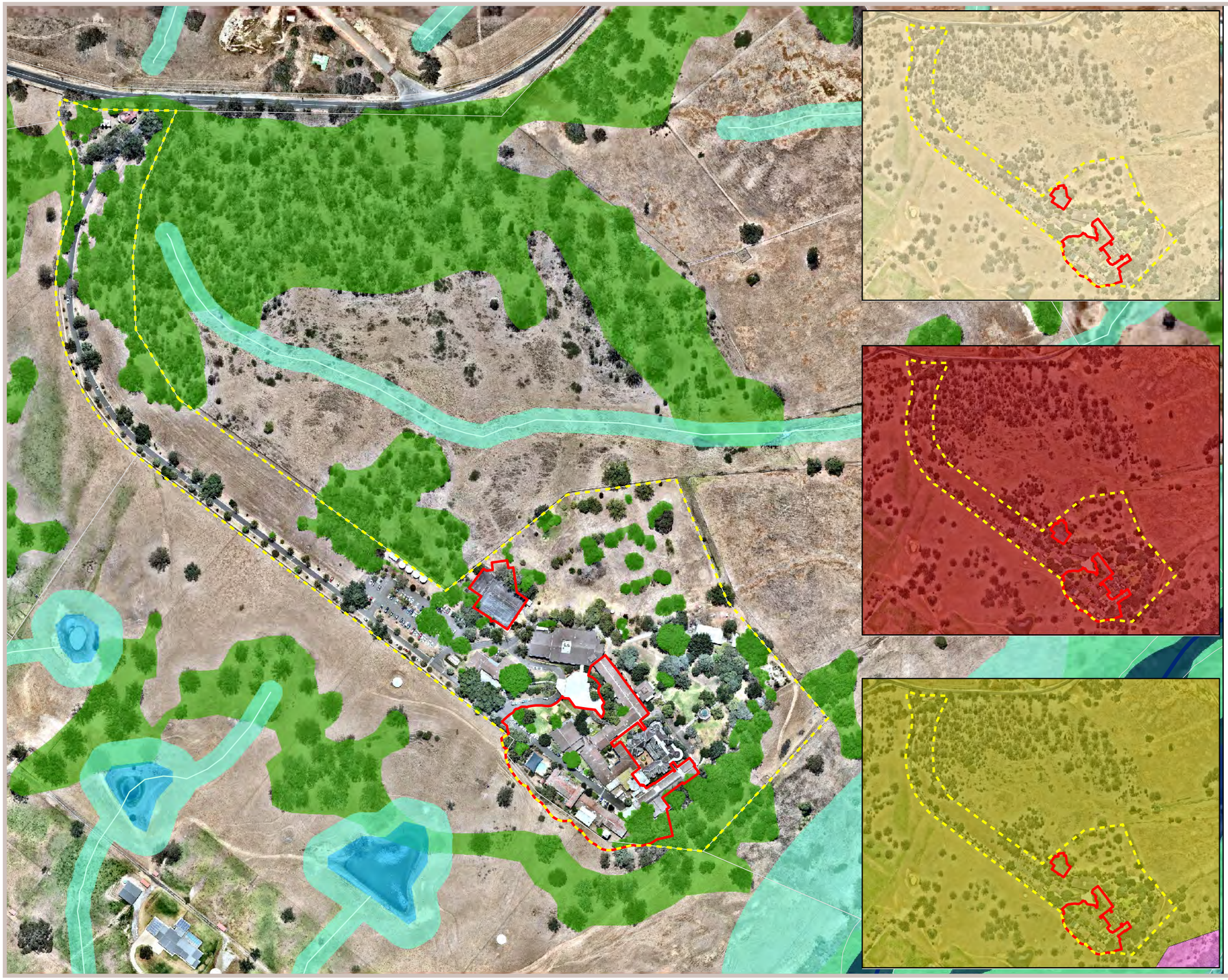


Figure 1. Site map

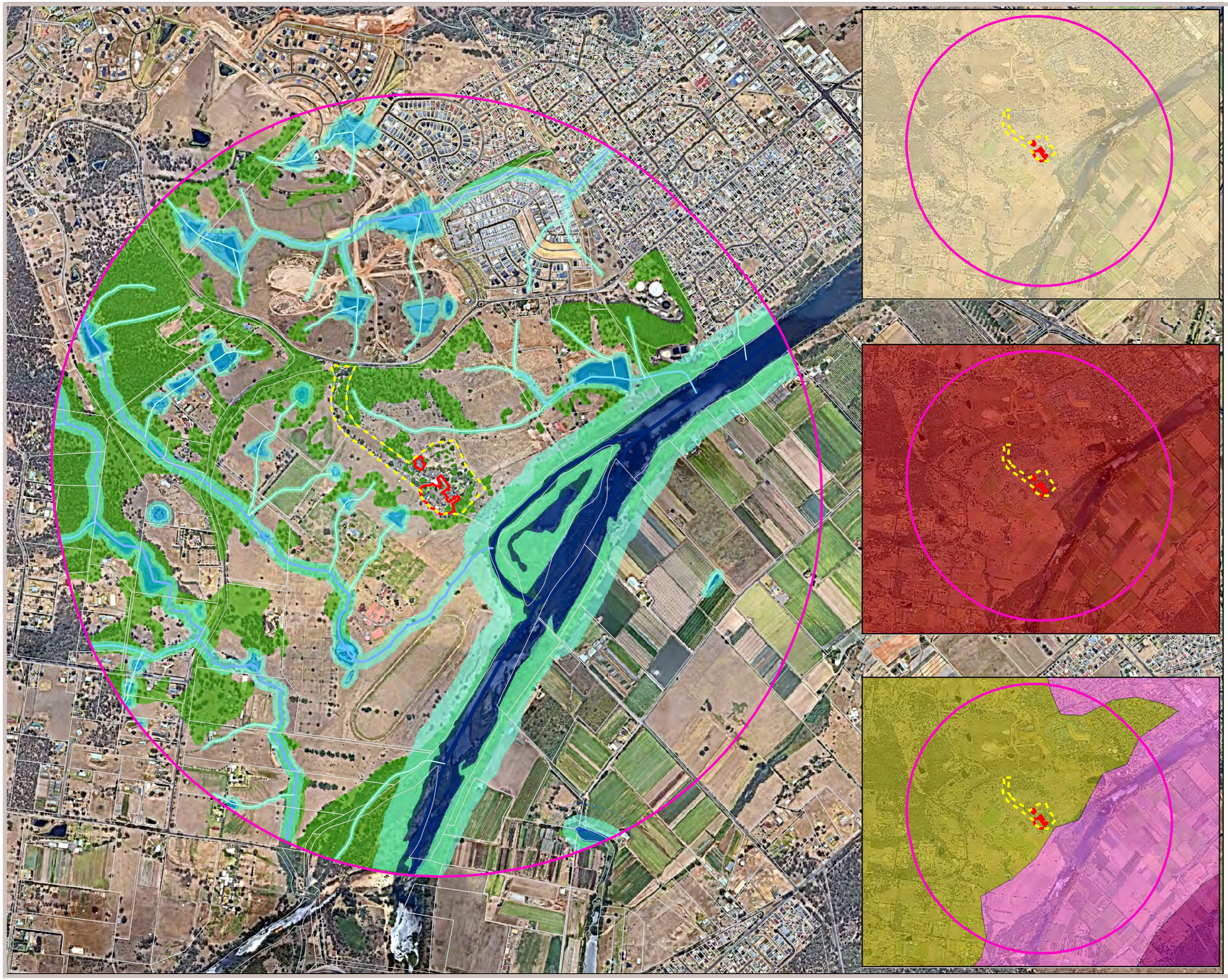
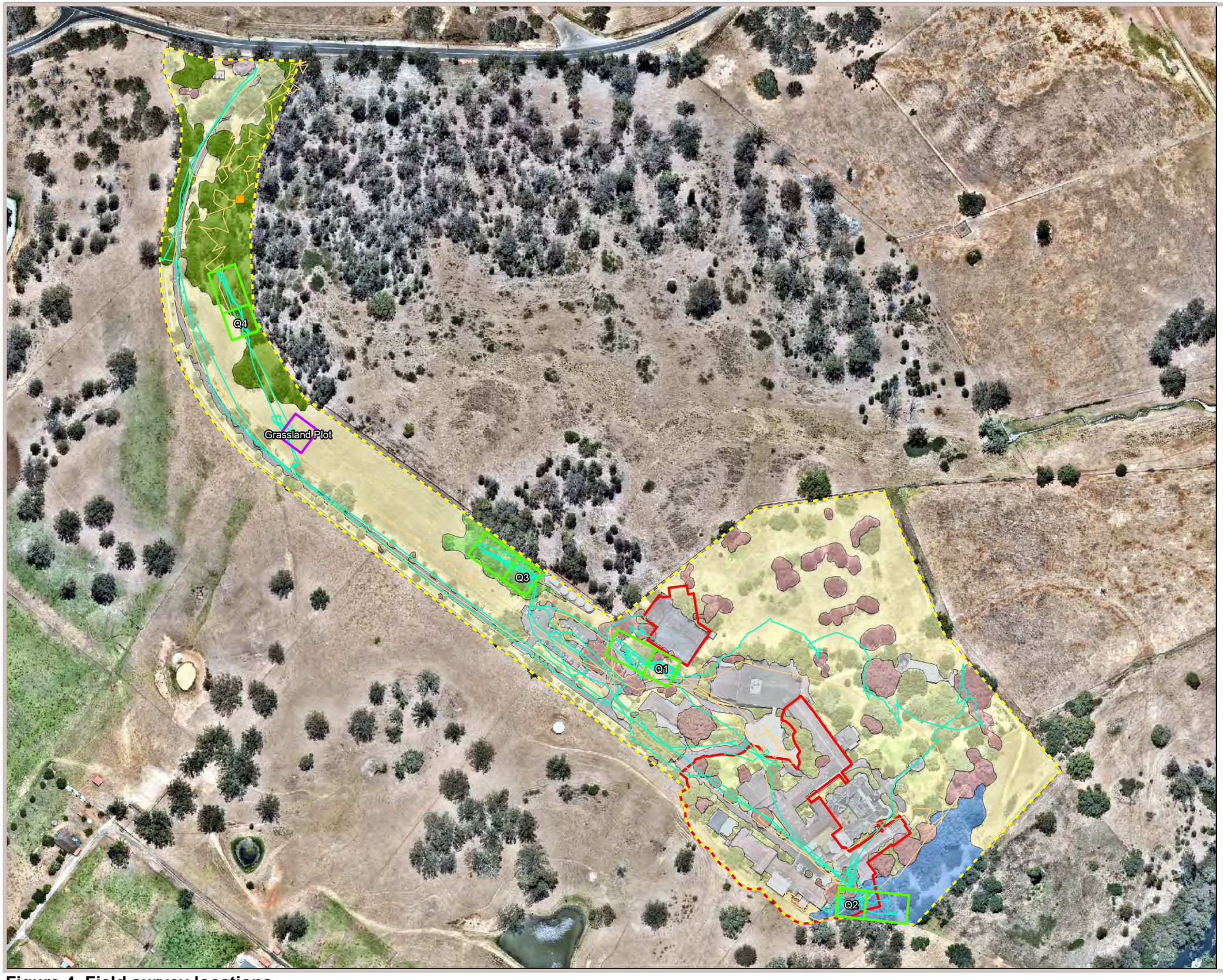


Figure 2. Location map

Figure 3. Layout of the project



Legend

- Subject Land
- Study Area

Flora Survey Locations

- BAM Plot
- Grassland Plot
- Random Meander

Fauna Survey Locations

- Random Meander (bird census, diurnal active search)
- Microchiropteran Bat Survey

Vegetation Zone

- Zone 1: PCT 1081 - Planted
- Zone 2: PCT 1395 - Remnant
- Zone 3: PCT 849 - Patch_A
- Zone 4: PCT 849 - Patch_B
- Exotic Vegetation
- Cleared Land

Image Source:
Image © NearMap 2019
Dated: 17/12/2019

Data Source:
NSW Government Spatial Services
SIX Maps 'Clip and Ship'
Hawkesbury LGA

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 100 m

I:\...\19166\Figures\RP1\20201008\Figure 4. Field survey locations

Figure 4. Field survey locations