Bonnyrigg Communities Plus Project - Stage 12 and Stage 13

Biodiversity Development Assessment Report

NSW Land and Housing Corporation

14 February 2024

Final

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Report No. 23123RP1

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Approved by:	**Bryan Furchert**
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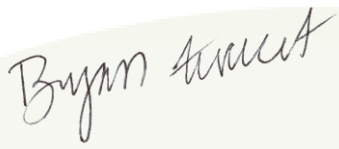
Signed:	
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Glossary

Term	Definition
Assessment area	Area of land within 1500m of the Subject Land as required by the BAM for non-linear developments
AHD	Australian Height Datum
BAAS	Biodiversity Assessor Accreditation System
BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
BOS	Biodiversity Offsets Scheme
°C	Degrees Celsius
CEEC	Critically Endangered Ecological Community
Council	City of Fairfield Council
DA	Development Application
DPE	NSW Department of Planning and Environment (formerly Department of Planning Industry and Environment (DPIE)
DBH	Diameter at breast height
DAWE	Former Commonwealth Department of Agriculture, Water and Environment
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DNG	Derived Native Grassland
EEC	Endangered Ecological Community
EES	Environment, Energy and Science Group (a former part of DPE)
EHG	Environment and Heritage Group (part of DPE)
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres
LAHC	NSW Land and Housing Corporation
LEP	Local Environment Plan
LGA	Local Government Area
NSW	New South Wales
OEH	Former NSW Office of Environment and Heritage

Term	Definition
Overall Project	The Bonnyrigg Communities Plus Project
PCT	Plant Community Type
The Project	The proposed Stage 12 and Stage 13 subdivision
SAII	Serious and Irreversible Impact
SEE	Statement of Environmental Effects
Subject land	The land subject to this BDAR assessment as required under the BAM.
TBDC	Threatened Biodiversity Database Collection
TEC	Threatened Ecological Community
VI	Vegetation Integrity

Declarations

Certification

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016*.

Signature: 

Bryan Furchert

Date: 14/02/2024

BAM Assessor Accreditation no: BAAS18095

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This document was prepared by Bryan Furchert (BAM Accredited Assessor No: 18095). This document, and associated field surveys and Geographic Information Systems (GIS) mapping, was prepared with the assistance of personnel outlined in Table 1.

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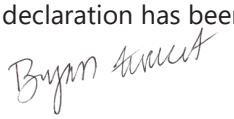
Declaration of Conflict of Interest

I declare that I have considered the circumstances and there is no actual, perceived, or potential conflict of interest. This declaration has been made in the interests of full disclosure to the decision-maker.

Signature: 

Bryan Furchert

Date: 14/02/2024

BAM Assessor Accreditation no: BAAS18095

1. Introduction

Cumberland Ecology was commissioned by the New South Wales (NSW) Land and Housing Corporation (LAHC, the 'proponent') to prepare a Biodiversity Development Assessment Report (BDAR) for a Development Application (DA) to facilitate the subdivision of land within the area subject to the Bonnyrigg Communities Plus Project (the 'Overall Project'). Specifically, this DA relates to subdivision for Stage 12 and Stage 13 of the Overall Project, which are collectively referred to in this BDAR as the 'Project'.

This BDAR will form part of the documentation for Development Consent under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The DA proposes the subdivision of the following three existing lots located in Bonnyrigg, NSW:

- Lot 453 DP 839627;
- Lot 454 DP 839627; and
- Lot 13 DP1143255.

These lots occur in the north-west of the Overall Project, within a future precinct referred to as the Town Hub. The Project will encompass all of Lot 453 and Lot 454 DP 839627, and the majority of Lot 13 DP1143255.

The Overall Project was initially approved by the Minister for Planning on 12 January 2009, and proposed to construct 2,332 dwellings across 18 stages over 13 years, along with the necessary infrastructure. Its purpose is to replace substantial areas of social housing in Bonnyrigg constructed in the 1970s and 1980s, consisting of 830 dwellings. Under a 2020 modification (MP06_0046 MOD 5) since the initial approval, these will be replaced with a mix of 30% social housing (900 dwellings) and 70% private housing, with 3000 dwellings to be constructed in total. It will include provision of open space areas, paths and cycleways, and the Town Hub precinct, which will facilitate establishment of cafes and outdoor dining facilities.

1.1. Requirement for BDAR

Under the NSW *Biodiversity Conservation Act 2016* (BC Act), all development that requires development consent under Part 4 of the EP&A Act that is likely to significantly affect threatened species, as set out in Clause 7.2 of the BC Act and Clause 7.1 to 7.3 of the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation), triggers the Biodiversity Offset Scheme (BOS) and must be assessed using the Biodiversity Assessment Method (BAM) 2020 with the results presented in a BDAR. The BOS is also triggered if impacts occur on an area mapped on the Biodiversity Values Map published by the Environment Agency Head. The Project requires clearing of native vegetation above the area clearing threshold, which is one of the triggers for determining if it is likely there will be an impact to threatened species, and as such, a BDAR is required for the Project. The smallest lot associated with the project (Lot 13 DP1143255) does not have a minimum lot size under the *Fairfield Local Environment Plan 2013* (the 'LEP'). As such the actual lot size of approximately 0.03 ha has been used to determine the native vegetation clearing threshold as 0.25 ha in accordance with the BAM. Approximately 1.73 ha of native vegetation is proposed to be cleared for the DA.

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 in accordance with the requirements of Division 6.2 of the *Biodiversity Conservation Regulation 2017*. 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), threatened ecological communities (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 comprises all areas relevant to the Stage 12 and Stage 12 DA as shown in **Figure 1** (hereafter referred to as the 'Subject Land'). The Subject Land is located approximately 30 km west of the Sydney CBD and is located entirely within the City of Fairfield Local Government Area (LGA). The Subject Land is bounded by Bonnyrigg Plaza and Bonnyrigg Primary School to the west, Tarlington Parade to the south, Tarlington Reserve to the east, and Bonnyrigg Avenue and a wedding function centre to the north. The wider area surrounding the Subject Land comprises of urban development, with the closest areas to the Subject Land predominately consisting of other stages of the Overall Project, some of which are complete, and also stages that have not commenced yet, currently consisting of existing residential areas comprising social housing.

A site map and location map have been prepared in accordance with the BAM and are presented in **Figure 1** and **Figure 2**, respectively. The Subject Land comprises the area of land directly impacted by the Project as shown in **Figure 1**. For the purposes of this assessment, the Subject Land comprises both the construction footprint (including additional temporary areas that may be disturbed by construction activities such as stockpiling) and the operational footprint of the project (the final development footprint in the long-term).

1.3.2. Project Overview

The DA assessed within this BDAR seeks approval for the Stage 12 and Stage 13 subdivision. Specifically, this development proposes subdivision of the Subject Land for the purpose of facilitating renewal of the existing Bonnyrigg Housing Estate (107 social dwellings) to create four super-lots for 615 future apartments, to be progressively developed in three stages. The apartments will comprise 171 social housing dwellings (27.8% of total) and 445 private, affordable housing dwellings (AJ+C and architectus 2019). It will also facilitate the development of the Town Hub area which will contain a plaza, and open space recreational areas, including outdoor dining. It is adjacent to the existing shopping centre, Bonnyrigg Plaza, and the Town Hub is proposed to be the focal point for residents of the dwellings to be constructed for the Overall Project.

The project layout is shown in **Figure 3**. For a further detailed description of the project, please refer to the Statement of Environmental Effects (SEE) prepared by (Premise 2022c) to support the DA.

1.3.3. Identification of the Subject Land

The Subject Land consists of the area subject to the proposed subdivision and consequent construction for the Project. The Subject Land includes all future infrastructure, and temporary stockpiles. Any access to the Subject Land in order to facilitate the project will be through existing local road infrastructure, and no additional vegetation clearing will be undertaken outside the Subject Land to facilitate access.

A bulk earthworks area has been identified within the Subject Land to facilitate construction of new roads and open space areas. All vegetation will be cleared in these areas. Along much of the western boundary of the Subject Land there is a 6m wide buffer area (**Figure 3**), in which all trees and associated canopy of planted native and remnant native trees will be retained (**Figure 12**). These areas will be subject to planting, and as such existing ground layer vegetation will be removed. For this reason, they have been included in the Subject Land. In the north-east there is a strip of trees outside the Subject Land with overhanging canopy into the Subject Land. These trees have been considered likely to be retained under future DAs as the stems are outside the Subject Land (**Figure 12**), and as such this canopy area is excluded from reporting of clearing areas for native vegetation within this BDAR.

The final building footprints within each of the four super-lots outside of the 6m buffer area is unknown at this stage. Under Clause 7.1 of the *Biodiversity Conservation Regulation 2017,* vegetation clearing for a subdivision is taken to include all clearing that in the opinion of the relevant consent authority or other planning approval body is required or likely to be required to be removed for the purposes for which the land is to be subdivided. As the impacts of building footprints and associated services that will result from the subdivision are unknown currently, a precautionary approach has been taken, and for the purposes of preparing this BDAR it has been assumed all vegetation will be cleared within the Subject Land, outside of the 6m buffer area and overhanging canopy areas, despite intention of LAHC to retain trees where possible under subsequent DAs.

The Subject Land and 6m buffer area are shown in **Figure 1** and **Figure 3**.

1.3.4. General Description of the Subject Land

The Subject Land currently consists nearly entirely of residential dwellings, comprising social housing, and associated yards, part of a local sport reserve, and hard stand areas such as roads and footpaths. A review of historical aerial photographs shows that by 1947 over half of the Subject Land had been cleared for agriculture, with the main occurrence of remnant vegetation occurring in what is currently the northern half of Tarlington Reserve, and to the north of Derry Way. Some smaller patches remained around the area of the western extent adjoining Tarlington Road in the Subject Land, contiguous with a larger patch in what is currently the grounds of Bonnyrigg Primary School. By 1967 the majority of the northern patch of vegetation had been cleared for agriculture, with the small patch adjacent to Bonnyrigg Primary School remaining. By 1984 when clearing for the current extent of social housing within the Subject Land had been completed, and most houses built, the only remaining vegetation attributable to what were previously bushland remnants are isolated trees around the start of Derry Way in the north, and the area adjacent to Bonnyrigg Primary School, in the western extent of what is currently a disused childcare centre.

The Subject Land has an overall flat topography, with areas in the west of slightly higher elevation than those in the east, with an approximate topographic high of 47 m Australian Height Datum (AHD) in the west and topographic low of approximately 38 m AHD in the east.

The entire Subject Land is mapped as the Blacktown Soil Landscape (DPE 2023b), which is described as comprising the Wianamatta Group—Ashfield Shale consisting of laminite and dark grey siltstone, and Bringelly Shale which consists of shale with occasional calcareous claystone, laminite and infrequent coal.

1.4. Information Sources

1.4.1. Databases

Databases used to prepare this BDAR include:

- The Department of Planning and Environment (DPE), Environment and Heritage Group (EHG) BioNet Atlas (EHG 2023d);
- EHG Threatened Biodiversity Data Collection (TBDC) (EHG 2023e);
- EHG BioNet Vegetation Classification database (EHG 2023a);
- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Species Profile and Threat Database (DCCEEW 2023b); and
- DCCEEW Directory of Important Wetlands in Australia (DCCEEW 2023a).

1.4.2. Literature

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

- Landscape Plans: Bonnyrigg Urban Renewal Stages 12 & 13 - Tarlington Parade & Bonnyrigg Avenue, Bonnyrigg NSW (Premise 2022a);
- Proposed Plan of Subdivision - Staging Plan: Bonnyrigg Communities Plus Project 2020/443 Tarlington Parade & Bonnyrigg Avenue (Premise 2022b);
- Statement of Environmental Effects: Bonnyrigg Communities Plus Stages 12 & 13 (Premise 2022c);
- Arboricultural Impact Assessment: Bonnyrigg Living Communities Project - Subdivision Stages 12 & 13 (Creative Planning Solutions 2022);
- Native Vegetation of the Sydney Metropolitan Area. VIS_ID 4489 (OEH 2016); and
- NSW State Vegetation Type Map (DPE 2023).

Other sources of information have been referenced throughout this BDAR.

1.4.3. Aerial Photography

The aerial imagery used in this BDAR is sourced from NearMap and is dated 3 February 2023, as at the time of preparation of the vegetation mapping in the BDAR this aerial was the clearest aerial available, with the least shading, and allowed the most precise mapping. Additional aerial images available on NearMap, Google Earth Pro and SixMaps were also consulted. Due to the removal of several offsite and overhanging trees in the north of the Subject Land which have died since the 3 February 2023 aerial, NearMap imagery dated 19 January 2024 was utilised to map some areas of vegetation in this area.

2. Methodology

2.1. Review of Existing Data

Existing information on biodiversity values within the assessment area (defined by the BAM as the Subject Land and a 1500 m buffer around it) was reviewed, which includes:

- Species data that is held in the BioNet Atlas (EHG 2023d);
- NSW State Vegetation Type Map (DPE 2023c); and
- Vegetation mapping contained within the Native Vegetation of the Sydney Metropolitan Area. VIS_ID 4489 OEH 2016).

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. The desktop assessment included searches of available aerial imagery from NearMap, and topographic contour data available from SixMaps. Field surveys undertaken on the 26th September and 12th December 2023 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 to landscape features were made following surveys of the Subject Land.

2.3. Native Vegetation Survey

2.3.1. Vegetation Mapping

Vegetation mapping studies have been undertaken across the Subject Land and surrounds, including broad scale mapping by the OEH (OEH 2016) and DPE (2023d).

Cumberland Ecology conducted vegetation surveys across the Subject Land on the 26th September and 12th December 2023. The vegetation within the Subject Land was ground-truthed to verify the condition and extent of the different plant communities mapped.

Mapping of plant communities within the Subject Land was done by random meander searches throughout each patch of vegetation. Key characteristics of areas with similar broad condition states such as tree cover, shrub cover, ground cover, weediness, and species composition, or combinations of these were noted to assist in vegetation mapping. Soils were also inspected.

Records of plant community boundaries were made using a hand-held Global Positioning System (GPS) and hand mark-up of aerial photographs. The information was synthesised using GIS to create a spatial database which was used 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 on the 26th September and the 12th December 2023. Only one BAM plot was necessary to satisfy the requirements of the BAM. However, to ensure that the degraded state of the Subject Land was assessed accurately an additional three plots were undertaken to assess condition of vegetation in areas of exotic dominated grassland and areas of planted native and exotic vegetation (**Figure 4**).

Due to the developed, suburban nature of the Subject Land, and the restricted nature of remnant vegetation to scattered remnant trees within yards and disjointed grassland areas, it was not possible to undertake a BAM plot entirely within the one PCT and one zone within the Subject Land, and a plot in any area of PCT 3320 within the Subject Land would have necessitated including areas of planted native vegetation, non-native vegetation, and hard-stand areas. As such, the plot location was chosen in a location in the south-west where there was slightly higher abundance and richness of native species in the ground layer. All areas however were assigned to the same zone based on high dominance of exotic grass species in the ground layer, the absence of a remnant shrub layer, and subsequently the composition of the community comprising mainly remnant/regrowth canopy trees only. As the plot was undertaken in the highest condition area within the one highly degraded zone, the plot location was considered appropriate using a precautionary approach. It should be noted, that due to the cadastral boundaries for the Subject Land not aligning precisely with the fenceline of the property in which Plot 1 was undertaken, the actual plot includes more areas of PCT 3320 canopy than is indicated in figures.

The 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 plot:

- 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 m 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 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

Table 2 summarises the plot requirements based on the size and number of vegetation zone in the Subject Land. As shown in this table, the minimum number of plots have been completed for the vegetation zones identified within the Subject Land. Additional plots were undertaken in areas of non-PCT vegetation in order to determine general condition of vegetation.

Table 1 BAM plot survey requirements

Vegetation Zone	PCT	Condition	Area (ha)	Min. No. of Plots Required	No. of Plots Completed
1	3320	Canopy	0.10	1	1
Total			0.10	**1**	**4**

2.4. Threatened Flora Species Survey

This section provides details of the threatened flora species surveys that have been undertaken in the Subject Land.

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 Flora Species Survey

Targeted threatened flora surveys were undertaken within the Subject Land for species credit species that were assessed as candidate species credit species for further assessment (see ***Section 5.3***). In general, the areas of PCT 3320 within the Subject Land are considered to be too degraded to support threatened flora species due to comprising only canopy trees persisting over lawn areas which have been mown for decades. As a precautionary approach, all flora species that historically could have had habitat within the Subject Land, despite the degradation, that were able to be confidently targeted during the survey times, either due to aligning with survey times documented in the TBDC, or due to being conspicuous shrub or sub-shrub species the botanist undertaking surveys at the time is familiar with, were considered to be candidate species.

As a further precaution, targeted threatened flora surveys also targeted candidate species credit species that were determined to 'not require further assessment' due to degraded microhabitats (see ***Section 5.3***). As all flora species within PCT 3320 areas were able to be identified at the time of the survey, and consisted only of common, non-threatened native species and exotic weeds, the majority of the species credit flora species which are shrubs and sub-shrubs, both those retained in the assessment and those not, would have been detected if they were present.

Species credit species that were assessed as candidate species credit species for further assessment targeted during surveys include: *Acacia pubescens, Dillwynia tenuifolia, Grevillea juniperina subsp. juniperina, Marsdenia*

viridiflora subsp. *viridiflora, Micromyrtus minutiflora, Persoonia nutans, Pimelea curviflora* var. *curviflora, Pimelea spicata, Pomaderris brunnea, Pultenaea parviflora,* and *Pultenaea pedunculata*.

Species credit species determined to not require further assessment due to degraded microhabitats but were surveyed for as a precaution include: *Deyeuxia appressa, Hibbertia puberula, Eucalyptus benthamii, Eucalyptus glaucina, Pterostylis saxicola*, and *Wahlenbergia multicaulis* – endangered population.

Targeted threatened flora surveys undertaken within the Subject Land included the 'parallel field traverses' method, on a small scale, with all ground underneath PCT 3320 canopy trees covered to the extent possible, in accordance with the '*Surveying threatened plants and their habitats*' (NSW Government 2020). Targeted surveys were implemented where possible in areas of PCT 3320 during the botany surveys on the 26th September and the 12th December.

Detailed descriptions of the methodology implemented for the threatened flora surveys are provided in the subsections below.

2.4.2.1. Parallel Field Traverses

Parallel field traverses were undertaken throughout the Subject Land in PCT 3320 for candidate species credit species in accordance with '*Surveying threatened plants and their habitats*' (NSW Government 2020). The transect width established was less than 5 m, for most areas, exceeding the minimum requirements for all threatened species for open areas. The location of the threatened species searches are shown in **Figure 5**.

Half of the area under one PCT 3320 tree was unable to be surveyed completely due to being behind a pointed security fence within a former childcare centre, with gates padlocked at the time of the survey, however the ground layer was visible within all areas under the tree within locations within 5m of where the botanist could access. Another tree was unable to be surveyed directly underneath due to location within a residential back yard, however all areas were visually surveyed across a fence, from within approximately the 10m required for all species in open areas, and it was determined this PCT 3320 patch was in the same condition as elsewhere, comprising a ground layer of mown, exotic grasses, and no native shrub layer.

More generally, the random meander survey method was utilised throughout the Subject Land during surveys for mapping, with surveys serving the dual purpose of targeting additional areas for threatened flora species.

Table 2 Threatened flora survey dates and methods

Scientific Name	Common Name	Survey Period	Dates of Survey within Subject Land	Survey Method
Acacia pubescens	Downy Wattle	All year	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Dillwynia tenuifolia	-	Aug. – Oct.	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys

Scientific Name	Common Name	Survey Period	Dates of Survey within Subject Land	Survey Method
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	All year	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Hibbertia puberula		Oct-Dec	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Marsdenia viridiflora subsp. *viridiflora*	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Nov-Feb	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Micromyrtus minutiflora	-	All year	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Persoonia nutans	Nodding Geebung	All year	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Pimelea curviflora var. *curviflora*	-	Oct-Mar	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Pimelea spicata	Spiked Rice-flower	All year	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Pomaderris brunnea	Brown Pomaderris	Aug. – Oct.	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys
Pultenaea parviflora	-	Sept. – Nov.	September 26 and December 12, 2023	Parallel field traverses, Random meander surveys

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.

An assessment of the presence of aquatic habitat was also undertaken to determine if any species listed under the *Fisheries Management Act* (FM Act) had potential to occur. No aquatic habitat is present within the Subject Land, and as such these species were excluded from further assessment.

2.5.2. Threatened Fauna Species Survey

All candidate fauna species were eliminated from further assessment due to either habitats being too degraded to support species, or due to habitat constraints being absent.

As such, targeted fauna surveys were not undertaken.

2.6. Weather Conditions

Weather conditions during the field survey were appropriate for detection of all target species credit species. A summary of weather conditions in the wider locality of the Subject Land (Rainfall: BOM Weather Station 067114 – Abbotsbury (Fairfield (City Farm)), Temperature: BOM Weather Station 067119 – Horsley Park Equestrian Centre AWS) 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)
26 September 2021	12.2	22.6	0
12 December 2023	20.8	31.6	5

A summary of the weather conditions in the weeks preceding the surveys is provided below:

- In the week prior to the September 2023 field survey, the average daily temperature range was between 11.4 – 25.8 °C, with a total of 0 mm of rainfall falling over the previous seven days;
- In the week prior to the December 2023 field survey, the average daily temperature range was between 18.8 – 34.1°C, with a total of 2 mm of rainfall falling over the previous seven days.

3. Landscape Features

This chapter provides a description of the landscape features of the Subject Land that are relevant to this assessment. All landscape features listed in Section 3.1 of the BAM are discussed below in subsequent subsections.

3.1. Assessment Area

The Subject Land is approximately 6.81 ha in area and is shown in **Figure 1** and **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 889.71 ha in area 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 Georges River catchment. No mapped watercourses occur in the Subject Land, however several watercourses occur within the assessment area, including Clear Paddock Creek, Green Valley Creek, and Orphan School Creek. These creeks and tributaries of the creeks include 1st, 2nd, and 3rd order streams. In accordance with Appendix E of the BAM, a riparian corridor of 10 m, 20 m, and 30 m either side of the waterway applies to 1st, 2nd, and 3rd order streams, respectively.

The Subject Land contains no rivers, streams or estuaries.

No estuaries occur within the assessment area.

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. No mapped areas of wetlands under *the State Environmental Planning Policy (Resilience and Hazards) 2021* the Subject Land and/or assessment area.

3.2.4. Habitat Connectivity

The Subject Land does not form part of a regional biodiversity corridor, flyway for migratory species, estuary, or a local corridor.

The vegetation in the Subject Land comprises predominately planted, and some remnant/regrowth trees, and areas of open, mown grassland, and with the exception of recreation areas and nature strips, this vegetation, along with suburban garden plantings is fenced within the yards of the residences of existing social housing. The native vegetation within the Subject Land has connectivity to some nearby vegetation patches totalling

approximately 57 ha, which includes fragmented patches of some PCTs such as other areas of PCT 3320 and riparian vegetation comprising PCT 4042, that offer little to no actual habitat connectivity, due to their situation within a highly fragmented urban environment. The habitat connectivity associated with Subject Land is identified in **Figure 1**.

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 surveys of the Subject Land, as well as a desktop assessment utilising searches of available aerial imagery from NearMap, and topographic contour data available from SixMaps.

3.2.6. Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value 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 (Mitchell) Landscape. The assessment area comprises a combination of the 'Cumberland Plain', and 'Georges River Alluvial Plain'.

3.2.8. Soil Hazard Features

No soil hazard features have been identified within the Subject Land or the assessment area.

3.3. Native Vegetation Cover

The native vegetation cover within the assessment area was determined by GIS and is shown in **Figure 2**. To map native vegetation cover within the Subject Land and assessment area, the assessment used the detailed vegetation mapping prepared by Cumberland Ecology in conjunction with broadscale mapping by DPE (2023), with amendments made by Cumberland Ecology.

The assessment area is approximately 889.71 ha in area, of which approximately 58.2 ha comprises native vegetation cover, which represents approximately 6.5% of the assessment area (entered into the BAM-C as 7% due to needing to use whole numbers). Therefore, the native vegetation cover value is assigned to the cover class of 0–10%.

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

4. Native Vegetation

4.1. Native Vegetation Extent

The native vegetation extent within the Subject Land was determined through aerial photograph interpretation, and field surveys. The native vegetation extent within the Subject Land occupies approximately ~1.85 ha (1.73 ha to be impacted) and is shown in **Figure 6**. The native vegetation extent within the Subject Land comprises predominately planted native trees, with only 0.1 ha of vegetation present attributable to PCT 3320, the only PCT present within the Subject Land.

No differences between the aerial photographs used in this assessment and the native vegetation extent shown in **Figure 6** 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 surrounds 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, middle and ground strata species.

The analysis determined that some of the native vegetation within the Subject Land aligns with one PCT held within the BioNet Vegetation Classification database, PCT 3320. **Table 4** provides a summary of the PCT, and other vegetation identified within the Subject Land. The distribution of the PCT within the Subject Land are shown in **Figure 7**. Detailed descriptions of the PCT and the justification for PCT selection is provided in the sections below.

Table 4 PCTs and other vegetation within the Subject Land

PCT #	PCT Name	Subject Land (ha)
3320	Cumberland Shale Plains Woodland	0.10
-	Planted Native	1.74
-	Exotic Woody Vegetation	0.50
-	Exotic Dominated Grassland	1.88
-	Cleared	2.70
Total		**6.92**

4.2.1. PCT 3320 - Cumberland Shale Plains Woodland

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 88

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

4.2.1.1. General Description

Cumberland Shale Plains Woodland is found throughout the Cumberland Plain. It is one of the plant communities associated with clay-rich shale soil derived from Wianamatta Shale occurring at elevations less than 150 meters above sea level throughout the driest part of the Sydney Basin (Benson and Howell 1990). It is a tall sclerophyll open forest to woodland with a sparse mid-stratum of soft-leaved shrubs and small trees with a grassy ground cover on the undulating shale plains of western Sydney (NSW Scientific Committee 2009b). The main canopy species include *Eucalyptus moluccana* (Grey Box), *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus fibrosa* (Broad-leaved Ironbark). The sparse shrub to small tree layer includes *Bursaria spinosa* (Blackthorn) and one or more species of Acacia, such as *Acacia parramattensis* (Parramatta Wattle). The mid-dense ground layer typically includes. *Microlaena stipoides* (Weeping Grass), *Themeda triandra* (Kangaroo Grass), *Dichondra repens* (Kidney Weed), *Brunoniella australis* (Blue Trumpet), *Cheilanthes sieberi* subsp. *sieberi* Poison Rock Fern), *Grona varians* (Slender Tick-trefoil), *Aristida ramosa* (Purple Wiregrass) and *Glycine tabacina* (Variable Glycine). This is the most widespread PCT on the Cumberland Plain, occupying much of the plain between Bankstown and the Hawkesbury and Nepean Rivers. While widespread, this PCT primarily occurs in small, often disturbed patches within a rural or urban matrix (NSW Scientific Committee 2009b).

The community occurs within the Subject Land in one condition zone, which is described below, and is distributed in small, isolated patches in the north and south of the Subject Land.

4.2.1.2. Condition Zones

Within the Subject Land, PCT 3320 exists as one condition zone, PCT3320_Canopy (**Figure 8**). The community persists as isolated remnant/regrowth canopy trees only, which occur over native and exotic plantings in some circumstances where garden vegetation is present underneath, but predominately over mown areas of exotic dominated grassland. The highest condition of these grassland ground layer areas occurs in the PCT 3320 patch in the south-west corner of the Subject Land, however native species were limited in this area to sparse occurrences of several common native grass and forb species, present as scattered individuals only within areas highly dominated by exotic species.

Within the Subject Land all PCT 3320 trees are *Eucalyptus moluccana* individuals, with the exception of a single *Eucalyptus fibrosa* in the south-western occurrence. No remnant native shrub layer is present within this vegetation community. The ground layer is dominated by exotic grass species including *Cenchrus clandestinus* (Kikuyu Grass), *Cynodon dactylon* (Couch), and *Ehrharta erecta* (Panic Veldtgrass), with other species such as *Eragrostis curvula* (African Lovegrass) and *Lolium perenne* (Ryegrass) occurring less frequently. Exotic forbs are

common and include *Trifolium repens* (White Clover), *Modiola caroliniana* (Red-flowered Mallow), and *Polycarpon tetraphyllum* (Four-leaved Allseed).

Native species, where present in the ground layer include the grasses *Eriochloa pseudoacrotricha* (Early Spring Grass) and *Microlaena stipoides* var. *stipoides* (Weeping Grass), the sedges *Carex inversa* and *Cyperus gracilis* (Slender Flat-sedge), and the forbs *Einadia trigonos* (Fishweed) and *Portulaca oleracea* (Pigweed).

An example of this vegetation community within the Subject Land is seen below in **Photograph 1**.

Photograph 1 PCT 3320_Canopy within the Subject Land

4.2.1.3. Justification of PCT Selection

The PCTs were initially filtered for the Sydney Basin IBRA region, Cumberland IBRA sub-region and by the vegetation formation Grassy Woodlands. Then including the dominant canopy species *Eucalyptus moluccana* (Grey Box) yielded four candidate PCTs (**Table 3**). The existing vegetation mapping, PCT descriptions, and final determination was reviewed. The final selection was made by the absence of *Eucalyptus punctata* (common to PCT 3321) and through the absence of any hills in the topography of the Subject Land (PCT 3319). The selection of this PCT involved:

- PCT Name;
- Upper/mid/lower stratum species;
- Diagnostic species;
- Review of existing vegetation mapping;
- Review of PCT descriptions;
- Review of soils and soil landscape mapping; and
- Landform elements.

Based on the detailed review of all items in combination with the floristic data collected, PCT 3320 was chosen as the best fit PCT. A summary of the PCT selection process is provided in **Table 5**.

Species recorded within PCT 3320 within the Subject Land that are listed for the PCT in the Bionet Vegetation Classification Database include *Eucalyptus moluccana*, *Eucalyptus fibrosa*, *Glycine tabacina, Carex inversa, Cyperus gracilis, Eriochloa pseudoacrotricha, Einadia trigonos, Dichondra repens, Oxalis perennans,* and *Portulaca oleracea*.

Table 5 PCT selection justification for PCT 3320

PCT Filtering Criteria Used	PCTs Considered	Selected PCT	Selected PCT Name	Species and Features Used for Identification
1. IBRA Region (Sydney Basin), IBRA sub-region (Cumberland), dominant canopy species (*Eucalyptus tereticornis, Eucalyptus moluccana, Eucalyptus crebra*), Formation Grassy Woodlands	3318, 3319, 3320, 3321	3320	Cumberland Shale Plains Woodland	Upper stratum species: *Eucalyptus moluccana*
2. Review of PCT description and associated documents	3320, 3321	3320	Cumberland Shale Plains Woodland	Topography of flat plains; presence of shale soils and associated soil landscapes, and absence of hills.
3. Absence of Eucalyptus punctata	3320	3320	Cumberland Shale Plains Woodland	Upper stratum species: *Eucalyptus moluccana*

4.2.1.4. 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 the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Within the Subject Land, areas of PCT 3320 Canopy conform to the CEEC Cumberland Plain Woodland listed under the BC Act following a comparison to the community's final determination, taking a precautionary approach (NSW Scientific Committee 2009b). It

should be noted that occurrences within the Subject Land do not match the description of the community as having a ground cover "dominated by a diverse range of grasses" listed as characteristic in the final determination.

Following an assessment against the 'Flowchart of key diagnostic features and condition thresholds to identify the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community' on Page 11, Chapter 3 of the EPBC Guidelines on Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Threatened Species Scientific Committee 2008b), it was determined that no areas of PCT 3320 meet the listing criteria for the CEEC listed under the EPBC Act. At the first step in the flow chart each patch present could be considered as having a canopy cover greater than 10% if considering each tree or patch of adjacent trees as a discrete patch, isolated by dwellings, infrastructure, and exotic dominated grassland areas. This is because patches were not part of larger patches of PCT 3320, such as native grassland areas, with a sparse canopy due to previous clearing. At the second step in the flow chart however, patches are determined not to be the listed EPBC community, as no patches of the community are greater than 0.5 ha in area with a perennial understorey vegetative cover that is made up of at least 30% native species.

4.3. Threatened Ecological Communities

One PCT identified within the Subject Land has been assessed as conforming to a TEC listed under the BC Act. **Table 6** summarises the TEC and associated PCT and condition identified within the Subject Land, whilst the distribution of the PCT is shown in **Figure 7**.

Table 6 Threatened ecological communities within the Subject Land

TEC Name	BC Act Status	Associated PCTs - Condition	Subject Land (ha)
Cumberland Plain Woodland	CEEC	3320 - Canopy	0.1

4.4. Non-PCT Vegetation Communities

As shown in **Figure 7**, an additional three vegetation communities are present in the Subject Land that do not conform to naturally occurring PCTs. These are described below.

4.4.1. Planted Native Vegetation

Throughout the Subject Land, the most widespread vegetation community is Planted Native Vegetation. This vegetation community consists of planted native canopy trees throughout the Subject Land, including *Corymbia maculata* (Spotted Gum), *Eucalyptus albens* (White Box), *Eucalyptus sideroxylon* (Red Ironbark), *Eucalyptus microcorys* (Tallowood), and *Casuarina glauca* (Swamp She-Oak). In the north-east of the Subject Land a strip of *Eucalyptus moluccana* trees are overhanging, though the stems are located on an adjoining property. Two of these offsite trees have been removed since the Arboricultural Impact Assessment (Creative Planning Solutions 2022). NearMap imagery from February 2023 shows these trees had brown foliage, with subsequent aerials showing them as defoliated stags, and by October 2023 the stags have evidently been removed. These trees appear to have been planted as they were relatively evenly spaced before tree removal, and in a straight line along a fence line. As such, although the species is associated with PCT 3320, the areas of canopy overhanging the Subject Land have been mapped as the Planted Native community as they appear to

have been planted for aesthetic purposes, rather than as revegetation – there is no understorey or ground layer plantings. These trees are highly likely to be retained as the stems are not within the Subject Land (**Figure 12**).

This vegetation community consists of planted native canopy trees between streets and dwellings, and as such a shrub layer is not present. A ground layer of predominately exotic grasses is present underneath native planted canopy trees, and in some areas garden plantings. Species composition within the ground layer includes *Cynodon dactylon* (Couch), *Plantago lanceolata* (Ribwort Plantain), and *Eragrostis curvula* (African Lovegrass).

The BAM includes a streamlined assessment module for "Planted Native Vegetation". This module simplifies the assessment of impacts on planted native vegetation within a development site. The decision-making key outlined in Section D.1 of Appendix D of the BAM provides a framework to determine whether the streamlined assessment module for planted native vegetation can be applied to a site.

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

The planted origin of the areas identified as 'Planted Native Vegetation' in the Subject Land is evident when reviewing a series of historical imagery from the 1940s onwards to present day, as per imagery held within the Historical Imagery Viewer (NSW Government Spatial Services 2023), and described in **Section 1.3.4**.

Table 7 Decision-making key to determine the application of the streamlined assessment module for planted native vegetation

Decision-Making Key	Response
1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?	No –Planted Native Vegetation does not form a mosaic with remnant native vegetation. The areas of Planted Native Vegetation within the Subject Land are separated from areas of PCT 3320, which occur as small, isolated patches.
2. Is the planted native vegetation: *a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and* *b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?*	No – the Planted Native Vegetation has not been planted for the purposes of environmental rehabilitation or restoration, or to replace or regenerate a PCT or threatened species population or habitat.
3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following: *a. a species recovery project*	No – the Planted Native Vegetation has not been planted to provide habitat for

Decision-Making Key	Response
b. Saving our Species project *c. other types of government funded restoration project* *d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat* *e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)* *f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or* *g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?*	threatened species under any of options a-g
4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?	No – Planted Native Vegetation was not undertaken for the purposes of revegetation, rehabilitation or restoration.
5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?	Yes – native species have been planted for aesthetic and privacy purposes only as part of the landscaping within the Subject Land, comprising street tree plantings, privacy screens, and garden vegetation. Planted Native Vegetation has been considered for use by threatened species within **Chapter 5** of this BDAR (The use of Chapters 4 and 5 of the BAM are not required to be applied).
6. Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)?	N/A

An example of this vegetation community is seen below in **Photograph 2**.

Photograph 2 Planted Native vegetation within the Subject Land

4.4.2. Exotic Woody Vegetation

Patches of Exotic Woody Vegetation occur throughout the Subject Land in the form of exotic street trees and garden plantings between streets and dwellings. Exotic canopy trees found within this vegetation community include *Morus alba* (White Mulberry), *Ulmus parvifolia* (Chinese Elm), and *Fraxinus americana* (White Ash). The community includes species such as *Corymbia citriodora* (Lemon-scented Gum) that are native to Australia but not designated as native under the BAM due to not occurring within NSW prior to European colonisation. There is a lack of a shrub layer within this vegetation community, with the exception of some garden plantings. The ground layer is composed of primarily exotic vegetation such as *Bidens pilosa* (Cobbler's Pegs), *Medicago polymorpha* (Burr Medic), and *Cenchrus clandestinus* (Kikuyu Grass). An example of this vegetation community is shown below in **Photograph 3**.

Photograph 3 Exotic Vegetation/Urban Garden Plantings Vegetation Community within the Subject Land

4.4.3. Exotic Dominated Grassland

Occurring throughout the Subject Land are patches of Exotic Dominated Grassland. This vegetation community occurs as maintained turfs, lawns, and ovals throughout the Subject Land. No canopy trees or shrub layer are present in this vegetation community. It is dominated by exotic grass species. Species include *Cenchrus clandestinus* (Kikuyu Grass), *Trifolium repens* (White Clover), and *Hypochaeris glabra* (Smooth Cat's Ear). An example of this vegetation community is seen below in **Photograph 4**.

Photograph 4 Exotic Dominated Grassland Vegetation Community within the Subject Land

4.5. Exotic Species

As indicated by the results of the field surveys, the vegetation in the Subject Land is highly degraded and dominated by exotic species overall.

Of the exotic species recorded from the Subject Land, five species are listed as High Threat Exotic species under the BAM (**Table 7**), with all the species considered not manageable. High Threat Exotic species are defined in the BAM as vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.

None of the species recorded within plots within the Subject Land are considered to be State Priority weeds or Regional Priority weed listed in the *Greater Sydney Regional Weed Management Plan 2023-2027 (LLS: Greater Sydney 2022)*.

Table 8 Weeds listed as High Threat Exotics

Scientific Name	Common Name
Bidens subalternans	Greater Beggar's Ticks
Cenchrus clandestinus	Kikuyu
Ehrharta erecta	Panic Veldtgrass
Eragrostis curvula	African Lovegrass
Paspalum dilatatum	Paspalum

4.6. 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. Patch sizes were determined in accordance with Subsection 4.3.2 of the BAM. Patch size is defined as an area of intact native vegetation that occurs on the development site and includes native vegetation that has a gap of less than 100 m to the next area of moderate to good condition native vegetation (or ≤30 for non-woody ecosystems). Areas of PCT 3320 vegetation within the Subject Land have connectivity to adjacent native vegetation comprising approximately 57 ha and were subsequently assigned to the 25 -<100 ha patch size class. Patch size and the extent of vegetation zones within the Subject Land are shown in **Figure 1.**

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

Two management zones apples to the vegetation zones within the Subject Land which are:

- Complete Removal – These areas will have all vegetation removed; and
- Ground Removal – These areas will have the ground layer removed as they occur within a strip to be planted with landscaping plantings along the western boundary within the 6 m buffer areas (**Figure 3**) The PCT 3320 trees will be retained in these areas.

Vegetation zones, patch sizes and VI scores for the Subject Land are summarised in **Table 9**.

Table 9 Vegetation zones within the Subject Land

Vegetation Zone	PCT#	Management Zone	Condition Name	Area (ha)	Patch Size Class (ha)	VI Score
1	3320	Complete Removal	Canopy	0.09	25 -<100	29.2 (Composition: 23 Structure: 20.8 Function: 51.8)
2	3320	Ground Removal	Canopy	0.01	25 -<100	29.2 (Composition: 23 Structure: 20.8 Function: 51.8)

5. Threatened Species

5.1. Identifying Threatened Species for Assessment

The Biodiversity Assessment Method Calculator (BAMC) generates a list of threatened species requiring assessment. The following criteria have been used to predict the threatened species requiring further assessment:

- IBRA subregion: Cumberland;
- Associated PCTs: 3320;
- Percent native vegetation cover in the assessment area: 6.5%;
- Patch size / class: 57 ha / 25 -<100 ha; and
- Credit type: Ecosystem and/or species.

Based on the above variables, the BAMC generated a list of 20 ecosystem credit species and 31 species credit species for assessment. These totals include eight dual credit species which are considered as ecosystem credit species for their foraging habitat and as species credit species for their breeding habitat. Ecosystem credit species and species credit species are assessed further in ***Section 5.2*** and ***Section 5.3***, respectively.

5.2. Ecosystem Credit Species

Table 10 lists the predicted ecosystem credit species for the vegetation zones within the Subject Land. It notes 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, with the exception of one.

Table 10 Ecosystem credit species

Scientific Name	Common Name	Sensitivity to Gain Class	Relevant PCTs	Retained in Assessment	Justification if Not Retained
Falco subniger	Black Falcon	Moderate	3320	Yes	-
Ephippiorhynchus asiaticus	Black-necked Stork	Moderate	3320	No	Not retained due to lack of habitat constraints. There are no swamps, wetlands, lakes or estuaries within or within 300m of the Subject Land.

Scientific Name	Common Name	Sensitivity to Gain Class	Relevant PCTs	Retained in Assessment	Justification if Not Retained
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	High	3320	Yes	-
Stagonopleura guttata	Diamond Firetail	Moderate	3320	Yes	-
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Moderate	3320	Yes	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	3320	Yes	-
Pandion cristatus	Eastern Osprey (foraging)	Moderate	3320	Yes	-
Petroica phoenicea	Flame Robin	Moderate	3320	Yes	-
Calyptorhynchus lathami	Glossy Black-Cockatoo (foraging)	High	3320	Yes	-
Pteropus poliocephalus	Grey-headed Flying-fox (foraging)	High	3320	Yes	-
Miniopterus orianae oceanensis	Large Bent-winged Bat (foraging)	High	3320	Yes	-
Miniopterus australis	Little Bent-winged Bat (foraging)	High	3320	Yes	-
Glossopsitta pusilla	Little Lorikeet	High	3320	Yes	-
Anthochaera phrygia	Regent Honeyeater (foraging)	High	3320	Yes	-
Petroica boodang	Scarlet Robin	Moderate	3320	Yes	-
Chthonicola sagittata	Speckled Warbler	High	3320	Yes	-
Dasyurus maculatus	Spotted-tailed Quoll	High	3320	Yes	-
Lathamus discolor	Swift Parrot (foraging)	Moderate	3320	Yes	-
Haliaeetus leucogaster	White-bellied Sea-Eagle (foraging)	High	3320	Yes	-

Scientific Name	Common Name	Sensitivity to Gain Class	Relevant PCTs	Retained in Assessment	Justification if Not Retained
Hirundapus caudacutus	White-throated Needletail	High	3320	Yes	-

5.3. Species Credit Species

Table 10 lists the predicted species credit species for the vegetation zone 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 16 flora species, two endangered flora populations, and 13 fauna species have been predicted for the Subject Land. Of these, 11 flora species have been retained for further assessment. All flora species retained in the assessment were targeted during surveys outlined in ***Section 2.4***.

Table 11 Species credit species assessment

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
Flora					
Acacia pubescens	Downy Wattle	High	3320	Yes	-
Deyeuxia appressa	Deyeuxia appressa	High	3320	No	This species has not been recorded since 1942 as per the TBDC and is only known from two locations pre-1942 that are remote from the Subject Land (Killara and Georges River south of Bankstown) (EHG 2023b). The two records are associated with damp habitats, that are not present within the Subject Land. Furthermore, the habitats in the Subject Land are highly degraded with a long history of disturbance, including replacement of the original ground layer with turf, and decades of mowing. This species has not been recorded from the Subject Land, and is not expected to occur.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
Dillwynia tenuifolia	Dillwynia tenuifolia	Moderate	3320	Yes	-
Eucalyptus benthamii	Camden White Gum	High	3320	No	This species is associated with floodplains, with recruitment triggered by flooding, and is only know from the Nepean River and associated tributaries, with most of the population except a few scattered trees around Camden and Cobbitty occurring in the Blue Mountains National Park and Bents Basin Conservation Area (EHG 2023d). As there are no floodplains or tributaries in the upper areas of the Nepean River within the Subject Land, it is considered that habitats have always been too degraded to support the species within the Subject Land, due to an absence of required habitat. Furthermore, the only occurrences of PCT 3320 within the Subject Land are highly degraded, with a canopy only of *Eucalyptus moluccana* and *Eucalyptus fibrosa – Eucalyptus benthamii* is a conspicuous tree species that is not present.
Eucalyptus glaucina	Slaty Red Gum	High	3320	No	This species is only known to occur between Casino and Broke to the north of Sydney, and additionally was recently recorded for the first time around Warragamba Dam. As such, the Subject Land has always been too degraded to support the species due to it being outside of the species' known areas of occurrence (EHG 2023d). Although the species could

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					be mistaken for *Eucalyptus tereticornis* without inspection of buds, juvenile leaves, and fruit for glaucousness (CANBR 2020), *Eucalyptus tereticornis* is not present within the Subject Land. The canopy of the highly degraded occurrences of PCT 3320 within the Subject Land consists of only *Eucalyptus moluccana* and *Eucalyptus fibrosa* – *Eucalyptus glaucina* is a conspicuous tree that is not present.
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	Moderate	3320	Yes	-
Hibbertia puberula	*Hibbertia puberula*	High	3320	No	Habitat is not present within the Subject Land for this species. *Hibbertia puberula* as a species without subspecies designation has not according to the final determination been collected in over 40 years, and is described as a sandstone species, and not associated with shales, such as the soils of the Subject Land (NSW Scientific Committee 2003). It is assumed this final determination pre-dates splitting of the species into subspecies within NSW, and records of all three subspecies have been recorded more recently than the last 40 years. *Hibbertia puberula* subsp. *glabrescens* is a separate threatened species in the BAM-C, under its former name *Hibbertia* sp. *Bankstown (NSW*

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					Scientific Committee 2010). This species is associated with sandy, tertiary alluviums, and not shale such as is present across the Subject Land. *Hibbertia puberula* subsp. *extensa* is only known from shallow soils on rock shelves, or upland swamps with heath, at the upper headwaters of the Georges River and in rock plate heath on the Wanganderry Tableland. It has also been collected near Mellong in 2022 (Botanic Gardens Trust 2023). Sandstone heath vegetation and soils on rock shelves at river headwaters are not present within the Subject Land. *Hibbertia puberula* subsp. *puberula* is associated predominately with sandstone and heath vegetation, and when occasionally on clay, it is not shale derived (Toelken and Miller 2012, EHG 2023d). Nearest records to the Subject Land are near Moorebank Avenue approximately 10km away where they occur on tertiary alluviums (i.e. sandy clays), not on shales (DPE 2023a, b). Furthermore, the habitats in the Subject Land are highly degraded with a long history of disturbance. Areas of PCT 3320 have been mown for decades which would preclude the persistence of any of these subspecies of sub-shrub within the Subject Land.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
Marsdenia viridiflora subsp. viridiflora - endangered population	*Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Moderate	3320	Yes	-
Micromyrtus minutiflora	-	High	3320	Yes	-
Persoonia nutans	Nodding Geebung	Moderate	3320	Yes	
Pimelea curviflora var. *curviflora*	-	High	3320	Yes	-
Pimelea spicata	Spiked Rice-flower	High	3320	Yes	-
Pomaderris brunnea	Brown Pomaderris	High	3320	Yes	-
Pomaderris prunifolia in the Parramatta, Auburn, Strathfield, and Bankstown Local	Pomaderris prunifolia - endangered population	High	3320	No	Removed because of Geographic Limitation. Subject Land is not within one of the LGAs listed in the final determination and the TBDC.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
Government Areas					
Pultenaea parviflora	-	Moderate	3320	Yes	-
Pultenaea pedunculata	-	High	3320	Yes	-
Pterostylis saxicola	Sydney Plains Greenhood	Moderate	3320	No	Habitats within the Subject Land are too degraded to support the species. The ground layer of areas of PCT 3320 has been historically removed and turfed, and then mown for decades, which would preclude persistence of this species within the Subject Land. Furthermore, the species is only known from a few known locations, none of which overlap with the Subject Land, and the habitat for the species is shallow soil on top of sandstone rocks, or mossy rocks in gullies, neither of which habitat types are present within the Subject Land (Threatened Species Scientific Committee 2008a, EHG 2023c). As such, the species is not expected to occur within the Subject Land, nor would have historically occurred.
Wahlenbergia multicaulis - endangered population	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	High	3320	No	The Subject Land is located outside of the endangered population's known distribution as Fairfield is not one of the identified LGAs identified in the BAM-C geographic limitations. Furthermore, the habitats in the Subject Land are highly degraded with a long history of disturbance. This species has not been recorded from the Subject Land.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
Fauna			3320		
Anthochaera phrygia	Regent Honeyeater (breeding)	High	3320	No	Habitat constraint is absent from the Subject Land - i.e. the Subject Land does not lie within Mapped Important Areas for this species. In NSW this species is known to breed in only two locations; at Capertee Valley and the Bundarra-Barraba region (NSW Government 2020d). In NSW, the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. The Subject Land is remote from these two locations and the vegetation in the Subject Land is highly degraded with a long history of disturbance. This species has not been recorded from the Subject Land and the likelihood of this species occurring is low.
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	High	3320	No	Habitat constraints are absent from the Subject Land. There is only one tree with a hollow within the Subject Land, and the single hollow is smaller than 15cm in diameter (EHG 2023d). The Subject Land is also considered too degraded to support the species due to historical clearing, and the lack of old growth remnant trees in the Subject Land large enough to have developed suitable hollows to provide breeding habitat for the species.
Haliaeetus leucogaster	White-bellied Sea-Eagle (breeding)	High	3320	No	Habitat constraints are absent from the Subject Land. The species requires large trees that are within

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					patches of forest, it is unlikely to utilise isolated trees in an urban matrix. Furthermore, the breeding habitat "is live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period" (EHG 2023d). As detailed in **Figure 5**, the entire Subject Land was surveyed for fauna habitat, and the only birds' nests located were observed to be occupied by Ibis, or to be of small bird species – this species has large nests comprising large sticks – no nests like this are present in the Subject Land. Finally, although there are creeks within 1 km of the Subject Land, the creeks are small, without expanses of open water capable of supporting abundant prey fish, and as such are unlikely to support a breeding pair.
Lathamus discolor	Swift Parrot (breeding)	Moderate	3320	No	Habitat constraint absent from the Subject Land - i.e. Subject Land does not lie within Mapped Important Areas. Furthermore, the habitats in the Subject Land are highly degraded with a long history of disturbance. This species has not been recorded from the Subject Land and it is considered unlikely to breed there.
Litoria aurea	Green and Golden Bell Frog	High	3320	No	Habitat within the Subject Land is degraded such that the species is unlikely to occur. The only water bodies within 1 km of the Subject

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					Land are urban creeks, highly likely to be inhabited by *Gambusia* fish which eat tadpoles of the species, and these have no connectivity with the Subject Land via damp habitats suitable for a frog species that requires pools to breed in, and damp areas to facilitate traversal. The species requires open water bodies that are free of *Gambusia* and have bulrushes and nearby grassy areas to shelter in (EHG 2023d). The Subject Land lacks any suitable aquatic habitats to support the species.
Meridolum corneovirens	Cumberland Plain Land Snail	High	3320	No	The Subject Land is too degraded to support the species. The species occurs in PCT 3320, however is "is reliant on a good cover of coarse woody debris, and uses soil cracks for shelter" (EHG 2023d), and as such requires the ground layer of the vegetation to be unmanaged to the extent coarse woody degree can accumulate. All areas of PCT 3320 are in locations where the original ground layer has been completely removed and turfed, and areas have been mown regularly for decades. As such, any local population, even if persisting through the historical agricultural use of the Subject Land and clearing of most vegetation, would not have persisted following the development of the Subject Land for social housing. The species is a fungal specialist (EHG 2023d), and most species of fungi would have been lost from degraded occurrences

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					of PCT 3320, with the removal of understorey and ground layer species, and urban land uses such as fertiliser use – additionally regular mowing removes accumulated litter capable of supporting fungi the species would feed on. Furthermore, the species is vulnerable to attack by rodents (EHG 2023d), and the site is within an urbanised area likely to support large populations of these predators. There are very few BioNet Atlas (EHG 2023d) records for the species within 10km of the centre of the Subject Land, and none close by, indicating the species has likely been absent from the locality for an extended period of time, due to the highly urbanised nature of the area, and the minimal remaining native vegetation.
Miniopterus australis	Little Bent-winged Bat (breeding)	Very High	3320	No	Habitat constraint absent from the Subject Land - i.e. Subject Land does not contain caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding. The Subject Land does not contain a known maternity cave for this species. This species generally forages in well-timbered areas including moist eucalypt forest, rainforest, vine thicket and dense coastal forests (NSW Government 2020c). These habitats are not present in the Subject Land and the vegetation that does occur is highly degraded with a long history of disturbance.

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
Miniopterus orianae oceanensis	Large Bent-winged Bat (breeding)	Very High	3320	No	Habitat constraint absent from the Subject Land - i.e. Subject Land does not contain caves, tunnels, mines, culverts or other structure known or suspected to be used for breeding. The Subject Land does not contain a known maternity cave for this species. This species hunts over the canopy of forested areas (NSW Government 2019a). The vegetation in the Subject Land is highly degraded with a long history of disturbance and would provide minimal potential foraging habitat due to the large areas of open grassland spaces interspersed with residential dwellings and hard stance areas and only small areas of remnant mature trees.
Myotis macropus	Southern Myotis	High	3320	No	Habitat constraints absent from the Subject Land. There are no waterbodies with open stretches of water within 200m of the Subject Land.
Pandion cristatus	Eastern Osprey (breeding)	Moderate	3320	No	Habitat constraints are absent – there are no large stick nests within the Subject Land. As indicated in **Figure 5**, the entire Subject Land was surveyed for nests and other fauna habitat.
Petaurus norfolcensis	Squirrel Glider	High	3320	No	Habitat within Subject Land is too degraded to support the species. The TBDC states the species "relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					typically need to be closely-connected (i.e. no more than 50 m apart)" (EHG 2023d). There are no old, large trees within the Subject Land. While the oldest *Eucalyptus moluccana* individuals are several decades old, they have not developed hollows and patches are greater than 50m apart overall. Further habitat notes are that the species "prefers mixed species stands with a shrub or Acacia midstorey", and the "require abundant tree hollows for refuge and nest sites" (EHG 2023d). This indicates the species cannot persist in areas without intact forest with old growth trees. Patches of PCT 3320 within the Subject Land are scattered, and do not contain a native shrub layer.
Phascolarctos cinereus	Koala (breeding)	High	3320	No	Habitat within the Subject Land is degraded such that the species is unlikely to occur due to the vast areas of open grassland spaces, isolation of the Subject Land by a local network of heavily trafficked roads, and only small areas of mature feed trees. Though koalas do cross open ground to move between trees (OEH, 2019), they would be highly unlikely to traverse the open areas of the Subject Land, comprising in large part hardstand areas, and fenced suburban yards to access such small, degraded, and exposed patches of woodland as those occurring in the Subject Land within PCT3320. The habitat present has little connectivity

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					to offsite habitat and only contains a few potential feed trees. The Subject Land comprises only a small area of scattered PCT 3320 trees, that would not provide adequate resources to support a koala population. Therefore, this species is unlikely to occur within the Subject Land. The species was not detected, during the fauna habitat survey detailed in **Figure 5** despite inspection of all trees for nests and hollows. There are only 7 BioNet records from an area within 10km surrounding the centre of the Subject Land (EHG 2023d), and all of these are towards the edge of the 10km area, greater than 5km from the Subject Land. The City of Fairfield is not one of the 74 LGAs subject to the Koala Habitat Protection chapters of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*, and as such there are no further assessment requirements beyond the BAM.
Pteropus poliocephalus	Grey-headed Flying-fox (breeding)	High	3320	No	Habitat constraints constraint absent from the Subject Land - i.e. no breeding camps are present within or adjacent to the Subject Land. This species is a canopy feeding frugivore and nectarivore and prefers a dense canopy, often in gullies or near water (NSW Government 2020b). These habitats are not present in the Subject Land, and it is unlikely to

Scientific Name	Common Name	Sensitivity to Gain	Relevant PCTs	Retained in Assessment	Justification if Not Retained as per Steps 1-3 of Section 5.2 of the BAM
					provide sufficient resources in the degraded patches of woodland for this species to utilise.

5.3.1. Presence of Candidate Species Credit Species

5.3.1.1. Surveys

A list of the candidate species credit species retained in this assessment and surveyed for within the Subject Land, including an identification of whether they were recorded in the Subject Land, is provided in **Table 11** below.

Details on the methodology of targeted surveys undertaken for the candidate species credit species for assessment are included in ***Section 2.4*** (flora).

It should be noted that two of the species *Pultenaea parviflora* and *Pultenaea pedunculata* were surveyed outside of the specified survey months. This was considered appropriate as one species is a shrub, and the other is a sub-shrub, and no woody species were detected at all in the mown ground layer of areas of PCT 3320 (with exception of juvenile individuals of the exotic *Sida rhombifolia* which variously can have woody sections of stem), and as such can be confidently excluded. Furthermore, these species were only surveyed for as a precautionary measure, as no threatened flora species are likely to have survived turfing and then decades of mowing of the ground layer of areas with remnant PCT 3320 canopy. In general, areas of PCT 3320 within the Subject Land are too degraded to support threatened flora species. Furthermore, one of the botanists that undertook surveys is experienced with surveying *Pultenaea parviflora* and is capable of confidently identifying the species outside of flowering times.

Table 12 Species credit species surveyed for within the Subject Land

Species	Present in Subject Land	Method of Identification	Biodiversity Risk Weighting
Flora			
Acacia pubescens	No	Survey	2
Dillwynia tenuifolia	No	Survey	2
Grevillea juniperina subsp. *juniperina*	No	Survey	1.5
Marsdenia viridiflora var. viridiflora	No	Survey	2
Micromyrtus minutiflora	No	Survey	3
Persoonia nutans	No	Survey	2
Pimelea curviflora var. curviflora	No	Survey	2

Species	Present in Subject Land	Method of Identification	Biodiversity Risk Weighting
Pimelea spicata	No	Survey	2
Pomaderris brunnea	No	Survey	2
Pultenaea parviflora	No	Survey	2
Pultenaea pedunculata	No	Survey	2

5.3.1.2. Expert Report

This assessment has not used any expert reports.

5.3.1.3. Candidate Species Occurrence

No species credit species were recorded within the Subject Land; and due to the degraded habitat present, no species were assumed to be present based on a lack of surveys.

6. Prescribed Impacts

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

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

An assessment of the relevance of these prescribed impacts to the project is provided in **Table 13**. The location of prescribed impacts is shown in **Figure 10**.

Table 13 Relevance of prescribed impacts

Prescribed Impact	Relevance to the Project
Habitat associated with karst, caves, crevices, cliffs, rock outcrops and other geological features of significance	Not relevant. Features are not present within the Subject Land.
Habitat associated with human-made structures	Relevant. Man-made structures will be demolished as part of the DA; however, these structures are not considered to provide habitat for any species credit species. They may provide some roosting habitat for ecosystem credit species such as microchiropteran bat species, as a number of buildings are present with access points to roof cavities.
Habitat associated with non-native vegetation	Relevant. Non-native vegetation occurring within the Subject Land is in the form of planted exotic trees and shrubs in gardens and as street trees, and areas of exotic dominated grassland. These may contain foraging habitat for ecosystem credit species such as small birds, and the Grey-headed Flying-fox.
Habitat connectivity	Relevant. The Subject Land and study area contain patches of vegetation that have connectivity (albeit minor) to vegetation that extends beyond the Subject Land. These are likely to form stepping-stone connectivity between larger patches of vegetation within the assessment area for threatened species. Following completion of the project, the connectivity across the Subject Land will

Prescribed Impact	Relevance to the Project
	be returned in a similar form, due to new plantings of trees along streets, beside buildings, and within parks.
Waterbodies, water quality and hydrological processes	Not relevant. There are no waterbodies within the Subject land and current hydrological processes are limited to artificial drainage, which will be unaltered following completion of the Project.
Wind turbine strikes	Not relevant. Project does not comprise a wind farm development.
Vehicle strikes	Relevant. The proposed subdivision will result in the creation of new access roads and private driveways. While roads and driveways exist currently, the intensity of residential dwellings will be increased and there will be a greater population, and heavier vehicle traffic, thereby increasing future vehicle use within the Subject Land and thereby increasing the potential of vehicle strike. No relevant literature is available to enable a prediction of the increase in vehicle strikes that may occur, nevertheless, the impacts of vehicle strike are considered likely to be minor and are unlikely to significantly impact on any threatened species. Due to the intensive urban nature of the site currently, limiting habitat for many threatened species, main risks associated to threatened species would be to mobile ecosystem credits that are currently able to forage across the Subject Land such as small birds and the Grey-headed Flying Fox.

7. Avoid and Minimise Impacts

This section includes demonstration of efforts to avoid and minimise impacts on biodiversity values identified within the Subject Land, which includes assessment of direct, indirect and prescribed impacts.

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

7.1.1. Project Location

Section 7.1.1 of the BAM states that knowledge of biodiversity values should inform the decision-making process relating to the location of a project. Measures to avoid or minimise impacts from clearing native vegetation and threatened species habitat can include locating the project in areas lacking or with low biodiversity values, avoiding areas mapped on the important habitat map, or avoiding native vegetation that is a TEC. A discussion of the considerations, measures and constraints relevant to avoidance are discussed in the sections below.

7.1.1.1. Considerations

In selecting the Project's final development footprint, the following matters were considered in accordance with the BAM:

a. *Knowledge of biodiversity values should inform decisions about the location of the proposal.*

The field surveys undertaken for this BDAR, including the recent surveys undertaken by Cumberland Ecology, have provided information on the various biodiversity values present in the Subject Land. The findings of these studies, including assessment of native vegetation and threatened species habitat, will be considered at the future DA stage for development and planning of location of apartment buildings within the four proposed superlots to be created as result of the subdivision DA subject to this BDAR.

The areas that comprise the highest biodiversity values within the study area are areas of the woodland form of Cumberland Plain Woodland TEC, which in this BDAR are represented by PCT 3320 'Canopy' condition zone. Where feasible the development will be situated to retain as many of these areas of PCT 3320 as possible without impacting the required outcomes for the project. Where there is scope to position buildings to retain any areas of PCT 3320, avoidance of impacts will be prioritised.

For the Project subject to the current subdivision DA, a commitment has been made to position buildings far enough from most sections of the western boundary of the Subject Land, to facilitate 6 m buffer areas (**Figure 3**) which will allow the retention of 0.1 ha of PCT 3320 comprising a large *Eucalyptus fibrosa* tree and areas of canopy of contiguous *Eucalyptus moluccana* trees, where the stems are located on adjoining properties. It should be noted that the actual area of this retained patch within the Subject Land is potentially larger than 0.1 ha, but due to a mismatch between digital representations of cadastral boundaries provided by NSW Spatial Services and the actual location of the fence line within the lot in the south-west of the Subject Land, the outer edge of the Subject Land in the south-west was unable to confidently be ascertained for the purposes of preparing figures and area estimates within this BDAR.

For the purposes of this BDAR, as detailed in Chapter 1, where future impacts for a subdivision DA are unable to be accurately estimated, removal of any vegetation that has potential to be removed must be assumed. As such all areas of PCT 3320 outside of the western 6 m buffer have been assumed to be removed under this BDAR and will be offset with purchase of biodiversity credits, however some of this vegetation, where feasible, will be retained under future DAs.

a. *Selecting a final proposal location may be an iterative process.*

The final location for the development footprints of apartment buildings under future DAs within the superlots created by the DA which this BDAR has been prepared for, will be subject to an iterative process, with avoidance of biodiversity values, particularly retention of additional PCT 3320 areas where feasible, part of the process for determining the locations.

b. *Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas lacking biodiversity values*

As stated earlier, the areas of highest biodiversity value in the study area are the scattered patches and isolated trees of PCT 3320, comprising degraded occurrences of the Cumberland Plain Woodland TEC. Due to the highly urban and degraded nature of the vegetation present within the Subject Land, situating the overall project within the existing Bonnyrigg social housing area, minimises potentially greater impacts that would be needed elsewhere to facilitate provision of commitments of affordable and social housing. Within the Subject Land, there is only one condition zone of PCT 3320, and no other areas of PCTs, as such there is no areas of PCTs with a lower VI score to prioritise when situating the future development footprints of buildings and infrastructure within the superlots.

However, as all vegetation outside of the areas of PCT 3320 is non-PCT vegetation of low retention value, where feasible development footprints will be situated to preference removal of these areas versus areas of PCT 3320.

It is recognised that the planted native trees, and in some circumstances exotic trees, provide some potential foraging habitat for various threatened species. For this purpose, where there is scope to modify location of future building and infrastructure locations under subsequent DAs to the subdivision DA, the hierarchy of avoidance will preference avoidance of areas of PCT 3320 first, areas of Planted Native vegetation second, and Exotic Woody vegetation third, with current hardstand areas and Exotic Dominated Grassland areas given the lowest priority for retention.

c. *Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a low vegetation integrity score)*

As mentioned previously, the project is located within an area of land that has been subject to historic disturbances, and as a result there is only one condition zone present of one PCT, and as such all areas of the PCT have the same VI score. Areas outside of PCT 3320 will be preferenced for removal under future DAs, where feasible without impacting the Project commitments for affordable and social housing provision.

e. *Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.*

Areas of PCT 3320 (the Cumberland Plain Woodland TEC) will be preferenced for retention under future DAs, where feasible. There are no areas within the Subject Land mapped on the Biodiversity Values Map or habitat maps for species credit species, and there are no areas determined to be significant habitat within the Subject Land for any species with a high biodiversity risk rating.

f. *Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas outside of the buffer area around breeding habitat features such as nest trees or caves.*

Following a survey of all vegetation within the Subject Land, there is only one hollow tree present, however due to the small size of the hollow there is no buffer area for any species credit species.

7.1.1.2. Measures

Avoidance measures will be prioritised for the retention of the vegetation with the highest biodiversity value, being the woodland form of Cumberland Plain Woodland CEEC (PCT 3320 Canopy). In selecting the project's final development footprint, the following avoidance and minimisation measures have been considered in accordance with the BAM:

a. *Consideration of alternative modes or technologies that would avoid or minimise impacts on biodiversity values*

The project will seek to consider alternative modes or technologies that that allow the avoidance of biodiversity values within the Subject Land under future DAs for development of the superlots and other areas to be created under the Project.

b. *Consideration of alternative routes that would avoid or minimise impacts on biodiversity values*

The general road structure for the Project is required to be determined at this subdivision stage (**Figure 3**) to facilitate creation of the superlots and open space areas. Location of access routes such as driveways within the superlots will prioritise retention of PCT 3320 areas where feasible while meeting the commitments for the Project at the stage of design for future DAs.

c. *Consideration of alternative locations that would avoid or minimise impacts on biodiversity values*

The proponent does not have proposed alternative locations for this project, and the Project needs to be undertaken within the Subject Land to avoid purchase of additional land that may be undeveloped and have greater biodiversity values, and also because the redevelopment of the Bonnyrigg social housing area to provide new social and affordable housing has already been committed to, and a concept plan for the Overall Project is already approved.

d. Consideration of alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.

In order to facilitate affordable and social housing commitments of both the Project and the Overall Project the proposal necessitates developing the areas that were approved under the Overall Project's Concept Plan. As discussed above, where feasible without impacting the Project's commitments, development will be located within the superlots to retain areas of PCT 3320.

7.1.1.3. Constraints

In selecting the project's final development footprint, the following constraints have been considered in accordance with the BAM:

a. Bushfire protection requirements, including clearing for asset protection zones

Due to the highly urban nature of the Subject Land, there are no requirements for asset protection zones.

b. Flood planning levels

No areas of the Subject Land are mapped as flood prone land. Due consideration has been given to stormwater management, but this will not increase the impacts of the Project beyond the Subject Land.

c. Servicing constraints

Servicing of the Subject Land will be required to connect to existing services. It is unlikely that servicing the Project will result in any additional impacts outside of the Subject Land, and connection with existing services where feasible without impacting the commitments of the Project will be designed to facilitate retention of biodiversity values, particularly areas of PCT 3320.

In addition to the above constraints, as the Project is a subdivision for a development for the LAHC, that is subject to an approved concept plan, there is a required outcome for each stage of the Overall Project to generate a predetermined number of dwellings of affordable housing and social housing. The number of social housing dwellings is required to replace removal of existing social housing, and develop additional social housing dwellings for a growing population. Stage 12 and Stage 13 are required to generate 171 new social housing dwellings, and 445 private dwellings of affordable housing. As such the size of apartment buildings within each superlot is likely to have a minimum size requirement, which may dictate location of each building within each superlot during future DAs.

7.1.2. Project Design

Section 7.1.1 of the BAM states that a project must document the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities. As the DA which is subject of this BDAR is for a subdivision and doesn't incorporate detailed designs of buildings that will be constructed under future DAs, only the designs for the subdivision can be commented on. Project design measures for the project to avoid or minimise impacts include:

- Locating the Project largely in areas previously disturbed (i.e. areas subject to previous urban development); and
- Retaining a 6 m buffer strip of trees along most of the western boundary of the Subject Land facilitating the retention of 0.1 ha of canopy of PCT 3320 and a number of Planted Native trees.

7.2. Avoid and Minimise Prescribed Impacts

Four prescribed impacts have been identified for the project: "Habitat connectivity", "Habitat associated with human-made structures", "Habitat associated with non-native vegetation", and "Vehicle strike". Measures to avoid and minimise these prescribed impacts are considered individually below.

7.2.1. Habitat Connectivity

The vegetation in the Subject Land consists mostly of scattered patches of remnant and regrowth native vegetation (PCT 3320), and Planted Native vegetation and Exotic Woody vegetation that exist over a highly modified understorey.

Although areas of native woody vegetation will be removed in the Subject Land, these areas occur either occur as individual trees or scattered patches that are already isolated and do not provide connectivity across the Subject Land, other than stepping-stone habitat. Accordingly, little connectivity is present in the Subject Land and the proposed removal of the vegetation present will not substantially reduce connectivity in the locality relative to current levels.

In determining the location and design of the Subject Land impacts, the project has sought to avoid and minimise impacts on habitat connectivity by retaining a buffer of trees along most of the western boundary which will result in the retention of north-south habitat connectivity through the Subject Land.

7.2.2. Habitat associated with human-made structures

The Project will remove several buildings comprising residential, social housing dwellings that have access points to roof cavities, which would facilitate potential access by ecosystem credit species such as threatened microchiropteran bat species. The removal of these structures is unable to be avoided or minimised in order to facilitate the commitments of the Project to provide affordable and social housing targets. However, minimisation of impacts to any individuals of threatened species potentially present will be undertaken in the form of pre-clearing surveys and clearing supervision as detailed in **Chapter 8**.

7.2.3. Habitat associated with non-native vegetation

Areas of non-native vegetation within the Subject Land provide some habitat to potential threatened fauna species and some non-threatened fauna species. Besides removal of foraging habitat, the main impact will be removal of a *Corymbia citriodora* tree with a single small hollow. While removal of exotic vegetation cannot be avoided to facilitate the commitments of the Project for provision of affordable and social housing, impacts to fauna species will be minimised by pre-clearing surveys, and clearing supervision, along with replacement of hollows, as detailed in **Chapter 8**.

7.2.4. Vehicle Strike

There is limited scope to limit the prescribed impact of vehicle strike, however the anticipated residential area speed limit of 50 km/hr is expected to appropriately minimise the potential impacts of vehicle strike. Any vehicle strikes on native fauna, in particular threatened species, associated with project are considered to be minimal as the Subject Land generally lacks habitat for native fauna, including threatened species.

8. Assessment of Impacts

8.1. Impacts on Native Vegetation and Habitat

8.1.1. Direct Impacts

The direct impact resulting from the proposed development (including all bushfire asset protection zones) is the loss of vegetation and associated habitat within the Subject Land, including the removal of one hollow-bearing tree, nine trees with Ibis nests, and an additional two trees with small bird nests. In addition, there will be removal of six buildings with an accessible roof cavity. There will be no direct impacts to any species credit species.

Table 14 identifies the extent of impacts to vegetation within the Subject Land. The extent of direct impacts to vegetation is anticipated to be restricted to the Subject Land and no direct impacts on adjoining areas of vegetation located outside of the Subject Land are considered likely to occur.

Table 14 Extent of impacts to vegetation within the Subject Land

PCT #	PCT Name	BC Act Status	Area impacted in the Subject Land (ha)
3320	Cumberland Shale Plains Woodland	CEEC	0.1*
-	Planted Native		1.63**
-	Exotic Woody Vegetation		0.50
-	Exotic Dominated Grassland		1.88
-	Cleared		2.70

Table Key: * Impacts include 0.09 ha total removal, and 0.1 ha of ground layer vegetation only, ** An additional 0.11 ha is present within the Subject Land but will be retained as overhanging vegetation or trees within the 6m buffer area, CEEC – Critically Endangered Ecological Community

8.1.2. Change in VI Score

Table 15 details the change in VI score for the vegetation zone and management zone. Current and future integrity scores are shown in **Table 15**.

Table 15 Change in VI score within the Subject Land

Vegetation Zone	PCT#	Management Zone	Area (ha)	Current VI Score	Future VI Score	Change in VI Score
3320_Canopy	3320	Complete Removal	0.09	29.2	0	29.2
3320_Canopy	3320	Ground Removal	0.01	29.2	10.3	18.9

8.1.3. Indirect Impacts

Table 16 outlines the indirect impacts to native vegetation and habitat. The indirect impacts of the project are not considered likely to be significant and are likely to be able to be managed appropriately. Mitigation measures to be implemented to manage the indirect impacts of the project identified below are presented in ***Section 8.3***.

Table 16 Indirect impacts of the project

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Inadvertent impacts on adjacent habitat or vegetation	Impact possible. Construction and operational activities may result in inadvertent impacts on retained vegetation in the study area.	Retained vegetation within the Subject Land in the 6m buffer area and vegetation in adjacent properties	Short term (during construction) and potential long term	Cumberland Plain Woodland	Further reduced condition of the retained areas of PCT 3320, as well as retained Planted Native trees and adjacent vegetation within adjoining properties.
Reduced viability of adjacent habitat due to edge effects	Impact possible. Construction and operational activities may increase edge effects on retained vegetation in the Subject Land and adjacent properties.	Retained vegetation within the Subject Land and adjacent properties.	Short term (during construction) and potential long term	Cumberland Plain Woodland	Further reduced condition of the retained areas of Cumberland Plain Woodland, as well as other retained vegetation in the Subject Land, and vegetation on adjoining properties.
Reduced viability of adjacent habitat due to noise, dust or light spill	Impact possible. The construction activities associated with the project are likely to increase the noise, dust and light above current levels within and immediately adjacent the Subject Land. Some	Retained vegetation within the Subject Land and adjoining properties.	Short term (during construction) and potential long term	Ecosystem credit species	Short term disruption of fauna habitat usage during construction, with potential for ongoing occupation impacts.

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
	impacts such as noise or light may persist during the operational phase.				
Transport of weeds and pathogens from the site to adjacent vegetation	Impact possible. Several high threat exotic weeds are known to occur within the Subject Land and may be inadvertently spread to surrounding vegetation.	Retained vegetation within the Subject Land, and vegetation on adjacent properties.	Potential long-term	Cumberland Plain Woodland	Further reduced condition of the retained areas of Cumberland Plain Woodland, and other retained vegetation in the Subject Land and adjoining properties.
Increased risk of starvation, exposure and loss of shade or shelter	Impact unlikely. Although some treed areas will be cleared as part of the project, these areas are mainly limited to planted trees over mown lawn and garden beds that currently provide to intact areas of remnant vegetation. The areas set aside for retention within the Subject Land and wider study area will continue to provide similar habitat, including shade and	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
	shelter for species likely to use the site. Vegetation on adjacent properties will continue to provide habitat, and in the future vegetation will be replaced with landscape plantings throughout the Subject Land, including species associated with Cumberland Plain Woodland.				
Loss of breeding habitats	Impact unlikely. Potential Fauna breeding habitat was not identified within the Subject Land.	-	-	-	-
Trampling of threatened flora species	Impact unlikely. No threatened flora species known or likely to occur within the Subject Land.	-	-	-	-
Inhibition of nitrogen fixation and increased soil salinity	Impact unlikely. The project is not considered to result in the inhibition of nitrogen fixation and	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
	increased soil salinity. Soils within the Subject Land are already likely to be substantially degraded due to extensive urban land uses.				
Fertiliser drift	Potential for impact, due to use of lawn and garden fertilisers within landscaped areas following completion of Project.	Likely limited to areas within or adjacent to fertiliser application.	Potential long term	Cumberland Plain Woodland	Consequences are likely to be minimal, but may facilitate weed invasion in retained PCT 3320 areas.
Rubbish dumping	Impact possible. Occupation of the Subject Land may result in rubbish dumping within adjoining areas of retained woody vegetation in the wider locality.	Retained vegetation within the Subject Land and surrounding properties	Potential long term	Cumberland Plain Woodland	Further reduced condition of the retained areas of Cumberland Plain Woodland, as well areas of other vegetation within the Subject Land and adjacent properties.
Wood collection	Impact unlikely to occur, considering the urban nature of the project.	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
Bush rock removal and disturbance	Impact unlikely. No bush rock has been identified within the Subject Land, therefore the project is not considered to result in this indirect impact.	-	-	-	-
Increase in predatory species populations	Impact unlikely. Considering the current status of the Subject Land as comprising suburban housing with yards, construction of apartments instead is likely to reduce habitat for predatory species such as rats, and reduce unsupervised access to outdoor areas by urban pets.	-	-	-	-
Increase in pest animal populations	Impact unlikely. Considering the current status of the Subject Land as comprising suburban housing with yards,	-	-	-	-

Indirect Impact	Nature	Extent	Duration	Threatened Entities Likely Affected	Consequences
	construction of apartments instead is likely to reduce habitat for pest animal populations and reduce unsupervised access to outdoor areas by urban pets which could produce future pest animal populations.				
Increased risk of fire	Impact unlikely. The project is unlikely to increase the currently low risk of bushfire, due to the lack of remnant bushland.	-	-	-	-
Disturbance to specialist breeding and foraging habitat	Impact possible. Intensified urban development may reduce availability of foraging habitat, or reduce utilisation.	Vegetation retained within and adjacent to the Subject Land	Potential long term	Ecosystem credit species	Further reduced condition of potential foraging habitat.

8.2. Prescribed Impacts

The project has been assessed as resulting in four prescribed impacts (see ***Section 5.4***):

- Habitat connectivity;
- Habitat associated with human-made structures;
- Habitat associated with non-native vegetation; and
- Vehicle strike.

An assessment of these prescribed impacts is provided below. No additional uncertain biodiversity impacts have been identified for the project.

8.2.1. Habitat Connectivity

8.2.1.1. Threatened Entities Affected

The stepping-stone habitat provided by the Subject Land may provide connectivity for the ecosystem species, such as the Grey-headed Flying-fox and woodland birds.

8.2.1.2. Nature

The vegetation in the Subject Land consists mostly of scattered patches of PCT 3320 that exist over a highly modified understorey, and Planted Native and Exotic trees.

Although the majority of native vegetation will be removed in the Subject Land, habitat connectivity will remain in the form of retained trees in the 6m buffer area along the western boundary, which is connect to a strip of trees on an adjoining property.

Vegetation in the Subject Land already comprises small, isolated patches and individual trees that do not provide connectivity across the Subject Land, other than 'stepping-stone' habitat, most likely to be used by highly mobile aerial fauna that do not need to cross roads on the ground. Accordingly, little connectivity is present in the Subject Land and the proposed removal of the vegetation present will not substantially reduce connectivity in the locality relative to current levels. It is further noted that the minimal level of connectivity present within the Subject Land is not identified in any published sources as being important to the connectivity of the bioregion. The vegetation within the Subject Land is likely to only be used as part of 'stepping-stone' habitat to more significant areas of remnant native vegetation, or utilised by highly mobile species able to access fragmented habitats.

8.2.1.3. Extent

The project will result in the removal of 2.09 ha of woody vegetation, comprising PCT 3320, Planted Native trees, and Exotic Woody Vegetation comprising already isolated patches of habitat. The habitat to be removed forms part of stepping-stone habitat within an already fragmented landscape.

8.2.1.4. Duration

The reduction of habitat connectivity will be a long-term impact. However, in the near to long term landscaping plantings throughout the Subject Land as part of the proposed development to be facilitated by the subdivision, will result in re-establishment of connectivity.

8.2.1.5. Consequences

The project itself is not likely to result in the isolation of an area of habitat from other areas of the habitat, as the vegetation in the Subject Land occurs as already small, isolated patches. Furthermore, connectivity on the local scale will remain as a buffer area in the west of the Subject Land, which connects to vegetation on an adjacent property, and in the long term will be re-established through other areas of the Subject Land.

The project will not result in the further isolation of habitat, but rather reduce the extent of the already isolated habitat present. The project will result in the reduction in woody vegetation stepping-stone habitat by approximately 2.09 ha. The reduction of these relatively small areas 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). Woodland birds and microchiropteran bats are also highly mobile and are unlikely to be restricted in movement by the removal of the small areas of vegetation from within the Subject Land. 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 in the locality.

8.2.2. Habitat associated with human-made structures

8.2.2.1. Threatened Entities Affected

The most likely threatened entities with potential to be impacted by removal of six buildings with access into the roof canopy would be ecosystem credit species such as microchiropteran bats which utilise such areas for roosting on occasion.

8.2.2.2. Nature

There are six building within the Subject Land that were identified as having an access point into the roof cavity.

8.2.2.3. Extent

Six buildings will be removed within the Subject Land which could comprise roosting habitat for microchiropteran basin species. This will result in a direct loss of habitat.

8.2.2.4. Duration

The removal of the buildings will be a long-term impact.

8.2.2.5. Consequences

The six buildings with accessible buildings are unlikely to form significant roosting habitat for bat species, as they may not be occupied, and there is similar habitat throughout the locality and the wider Sydney Area. These species are highly mobile and will also have access to higher quality areas of habitat such as hollows in remnant forest and woodland areas within the locality. If any species of bats are present, there will be a short-term disturbance event with removal of the habitat, after which they will need to relocate, but no individuals

or populations should be harmed in the long term, particularly with an experienced ecologist present during habitat removal, and to undertake surveys prior to ascertain occupation.

It is not considered likely that removal of buildings with accessible roof cavities will impact threatened species habitat located beyond the Subject Land.

8.2.3. Habitat associated with non-native vegetation

8.2.3.1. Threatened Entities Affected

The most likely threatened entities with potential to be impacted by removal of a single, small hollow in one exotic *Corymbia citriodora* are small hollow-utilising woodland birds such as the Little Lorikeet, or microchiropteran bat species.

8.2.3.2. Nature

There is one hollow bearing tree to be removed within the Subject Land. This will result in a direct loss of potential habitat.

8.2.3.3. Extent

One hollow bearing tree, with one small hollow will be removed.

8.2.3.4. Duration

The removal of the particular hollow will be long term, but the hollow can be replaced with nest boxes so hollow loss from the Subject Land will not be permanent.

8.2.3.5. Consequences

The removal of one hollow tree may result in loss of habitat for one individual or family group of a threatened or non-threatened bird species, or a microchiropteran bat species.

It is not considered likely that removal of the hollow will impact threatened species beyond the Subject Land, and the habitat can be replaced within the Subject Land with next boxes.

8.2.4. Vehicle Strike

8.2.4.1. Threatened Entities Affected

Vehicle strike has the potential to impact on a range of species including ecosystem species, such as the Grey-headed Flying-fox and avifauna. However, as the majority of the Subject Land and comprise small patches and isolated trees, mown grasslands, and hardstand areas and residential dwellings, faunal biodiversity is relatively low and there are no threatened fauna species considered to have a high risk for vehicle strike.

8.2.4.2. Nature

Although dwellings and roads are currently present, the construction of apartment buildings and higher density residential areas with associated roads, and an increased population, will result in an increase in vehicles that will traverse the Subject Land and will increase the risk of fauna vehicle strike.

8.2.4.3. Extent

The risk of vehicle strike will only occur within the proposed road network.

8.2.4.4. Duration

The risk of vehicle strike is considered to be a long-term potential impact.

8.2.4.5. Consequences

There is no data or relevant literature available to enable an estimate of vehicle strikes; however, the consequence of increased vehicle strike on native species known to occur in the locality and bioregion is not considered likely to be significant as it is expected that the numbers of wildlife struck by cars will be very low. This is because the proposed development predominantly will occur in areas predominately comprised of small patches and isolated trees, mown grasslands, and residential development, that are not currently utilised extensively by native species of fauna. When the development is complete, there will be even less potential habitat for native species and although it is possible, it is considered very unlikely that any species will be impacted to any significant extent by vehicle strike. Furthermore, it is expected vehicle movement will be slow (50km/hr speed limits) throughout the Subject Land and the potential increase in fauna vehicle strike will be minimal.

Accordingly, the consequences of the impacts for the local and bioregional persistence of any species that currently has the potential to utilise the Subject Land is very low.

8.3. Mitigation of Impacts to Native Vegetation and Habitat

This section presents a range of mitigation measures that have been developed for the project to mitigate the impacts to native vegetation and habitat that are unable to be avoided, as well as areas of native vegetation that will be avoided. These include measures to be undertaken before and during construction to limit the impact of the project. In accordance with the BAM Operational Manual, Stage 2, the measures adhere to SMART (Specific, Measurable, Achievable, Realistic, Timebound) principles.

The mitigation measures specified in this section are considered to be appropriate to mitigate the unavoidable impacts of the project, and if they are implemented as specified here, it will be considered that they have been successful, and no further verification of their success is required. They include a range of measures to be undertaken before, during and after construction to limit the impact of the project. Each mitigation measure is discussed in detail below, and a summary is provided in **Table 17**.

8.3.1. 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 Management Region and is subject to the Greater Sydney Regional Strategic Weed Management Plan 2023 – 2027 (LLS: Greater Sydney 2022) 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 2023 – 2027 (LLS: Greater Sydney 2022). 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 Subject Land 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 2023 – 2027 (LLS: Greater Sydney 2022). 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 Subject Land, 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 Subject Land following vegetation clearing activities, to contain any re-emergence of weed species.

8.3.2. 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.

8.3.3. Tree Protection Measures

As outlined in the Arboricultural Impact Assessment prepared by Creative Planning Solutions (2022); several tree protection measures are proposed to be implemented to avoid inadvertent impacts to trees that are marked for retention. These measures include the implementation of tree protection fencing, suitable tree protection zones, and temporary ground and root protection where relevant. Further details on tree protection measures are outlined in the Arboricultural Impact Assessment.

8.3.4. Pre-clearance Surveys

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.

As part of the pre-clearing surveys, all built structures with access to roof cavities to be demolished will also be inspected to identify any habitat features that have a high potential to support native fauna species, in particular, microbats. The surveys will include visual roost searches for crevices that a microbat may be able to access and roost in, with the aid of a torch where required, and the use of a hand-held ultrasonic bat detector. If any suitable roost sites are identified, additional surveys comprising roost watches and the deployment of ultrasonic bat detectors will be completed over a period of two nights to detect bats using the buildings. Any roost watches and ultrasonic bat detector surveys should be undertaken during spring/summer when microbats are more likely to leave their roost (and subsequently be detected) and not be carried out during periods of heavy rain. All targeted microbat surveys should be carried out by a qualified ecologist with a minimum of three years' experiences in surveying microbats.

8.3.5. 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.

The demolition of built structures will be guided by the results of the pre-clearing surveys. Where suitable bat roost sites and evidence of bat usage is recorded, the relevant built structures should be demolished under supervision of an ecologist. Staging of the demolition of the built structures may also be required to provide opportunity for any roosting bats to self-relocate. Depending on the location of potential suitable roosting sites, the method for demolition of the existing buildings may involve an initial removal of the roof structures, with the buildings left overnight without roofing. Demolition of the remaining portion of the buildings would then occur on the following day. The specific details of the recommended demolition process will be included in the pre-clearance letter, as required.

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.

8.3.6. Hollow Replacement

One hollow-bearing tree, with a total of one small hollow was recorded within an exotic tree to be removed within the Subject Land. This will be replaced at a 2:1 ratio for tree hollows, with nest boxes, with nest boxes matched to size of hollow removed. As such two nest boxes will be installed on trees to be retained within the Subject Land. Any other hollows identified at any point to be removed will be offset at a 2:1 ratio with nest boxes of a similar size to the hollow/s to be removed.

8.3.7. Sedimentation Control Measures

The project may result in erosion and transport of sediments because 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.

8.3.8. Landscaping

Where possible, it is recommended that native plant species characteristic of Cumberland Plain Woodland be incorporated into the landscape plan for the Subject Land. All native plant species should be sourced from local nurseries or come from seed sourced from the study area. The landscape plans for the project prepared by Premise (Premise 2022b) currently propose that an array of Cumberland Plain Woodland tree species will be planted in parkland areas including *Corymbia maculata, Eucalyptus crebra, Eucalyptus* eugenioides, *Eucalyptus fibrosa, Eucalyptus moluccana,* and *Eucalyptus tereticornis*.

Table 17 Summary of mitigation measures

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
Weed management	Direct, indirect	Appropriate weed control activities will be undertaken in accordance with the *Greater Sydney Regional Strategic Weed Management Plan 2023 – 2027* (LLS: Greater Sydney 2022).	Construction	Prior to construction, following vegetation clearing	Bush regenerator/ contractor	Moderate	Further Spread of weeds throughout the study area
Delineation of clearing limits	Indirect, prescribed	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 retained trees in adjoining vegetation.
Tree Protection Measures	Indirect, prescribed	Implementation of tree protection measures in accordance with the Arboricultural Impact Assessment.	Construction	Prior to construction and vegetation clearing	Project arborist	High	Unnecessary damage to retained trees in the Subject Land and study area.
Pre-clearance survey	Direct, prescribed	Pre-clearance surveys will be conducted in all areas	Construction	Once	Contractor/ project ecologist	Moderate	Increased and unnecessary

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
		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.					mortality of native fauna.
Staging of clearing	Direct, prescribed	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	Construction	Once	Contractor/ project ecologist	High	Increased and unnecessary mortality of native fauna.

Mitigation Measure	Impact Addressed	Proposed Techniques	Timing	Frequency	Responsibility	Risk of Failure	Consequences of Residual Impacts
		animal is unlikely to survive, it will be humanely euthanized)					
Hollow Replacement	Indirect, prescribed	Replace any removed hollows with similar size nestbox at 2:1 ratio	Construction	Throughout construction period	Contractor	Moderate	Loss of threatened species habitat
Sedimentation control	Indirect, prescribed	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	Moderate	Sedimentation into adjoining vegetation.
Landscaping	Direct, prescribed	Landscaping within the Subject Land to focus on using native flora species sourced from local nurseries and characteristic of PCT 3320	Operation	Post construction	Contractor	Low	Reduction in available habitat

8.4. Mitigation Measures for Prescribed Impacts

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

- Delineation of clearing limits;
- Pre-clearance survey;
- Clearing supervision and protocols;
- Hollow Replacement; and
- Sedimentation control measures.

No additional mitigation measures are proposed for prescribed impacts.

8.5. Adaptive Management for Uncertain Impacts

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

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

Due to the small scale of indirect and prescribed impacts, due to the degraded nature of the Subject Land, the project does not propose to use additional biodiversity credits to mitigate or offset indirect or prescribed impacts.

9. Thresholds for Assessment

9.1. 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; and
- 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.

9.2. Impacts on Serious and Irreversible Impact Entities

One candidate SAII entity has been considered as relevant to the project, being Cumberland Plain Woodland TEC. Further consideration of this entity is provided below.

9.2.1. Cumberland Plain Woodland

Cumberland Plain Woodland occurs as scattered patches within the Subject land, comprising mostly single isolated trees, over a ground layer dominated by mown, exotic grass species. There is a total of 0.1 ha of the community within the Subject Land. As it is not certain what areas can be retained under future DAs within the four future superlots, it is assumed for the purposes of this DA that all areas will be entirely removed, with the exception of 0.01 ha in the south-west, within a 6m buffer area where trees will be retained, and the ground layer removed. The location of the Cumberland Plain Woodland within the Subject Land is shown in **Figure 8** and includes all mapped areas of PCT 3320. **Figure 12** details canopy areas that will be retained.

Section 9.1.1 of the BAM requires the provision of additional information regarding SAII entities that are TECs. The additional information is required to assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact. The additional information requirements are provided in **Table 18**.

Table 18 Additional impact assessment provisions for Cumberland Plain Woodland

Criteria	Additional Impact Assessment Provisions	Response
1	The assessor is required to provide further information in the BDAR or BCAR regarding the impacts on each TEC at risk of an SAII. This must include the action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR and BCAR.	Avoidance of impacts to Cumberland Plain Woodland is addressed in **Chapter 7**.
2	The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including:	-
(a)	Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW and the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	The current total geographic extent of Cumberland Plain Woodland varies depending on the source interrogated. The current extent of Cumberland Plain Woodland in the TBDC is described as only less than 9% of the original extent remaining and does not include a conclusive total area for the community. BioNet Vegetation Classification Database estimates the current area of occupancy of the community based on the two PCTs (3319 and 3320) conforming to Cumberland Plain Woodland with available data as approximately 11,153 ha of the original 'Pre-European Extent' published on the database of 130,605 ha. These estimations are based on the NSW State Vegetation Map (DPE 2022). Cumberland Plain Woodland is also associated with a targeted recovery plan for the Cumberland Plain that was prepared by the Department of Environment, Climate Change and Water in 2011

Criteria	Additional Impact Assessment Provisions	Response
		(DECCW 2011). This document is the currently accepted standard for the retention and recovery of TECs in the Cumberland Plain. Table 2 of the recovery plan displays an estimated current total of Cumberland Plain Woodland of 24,530 ha, however, it is reported that a small portion of this total does not meet the listing criteria for the TEC. The same table also estimates the 'Pre-1750 (ha)' total of the community at 125,449 ha being a reduction in area to current levels of approximately 20%. Of the current total area, the recovery plan reports approximately 967 ha identified as occurring within reserves. The Final Determination for Cumberland Plain Woodland (NSW Scientific Committee 2009a) identifies that the TEC is restricted in geographic distribution to the Sydney Basin Bioregion and was estimated to have an extant area of approximately 11,054 ha (±1,564 ha) according to mapping by Tozer (2003), which covered the Cumberland Plain. This is reported by the final determination as being a reduction from the 'Pre-European distribution' by 8.8% (±1.2%) suggesting the Pre-European distribution of the community to cover approximately 125,613 ha. According to the Map of Critically Endangered Ecological Communities NSW Version 6 dated 25/02/2020 (DPIE 2020) the current extent of Cumberland Plain Woodland in NSW is approximately 23,020 ha. The mapping layer Threatened Ecological Communities Greater Sydney (DPIE 2021) provides a similar estimate for the current extent of Cumberland Plain Woodland as 21,951 ha. Apart from the State Vegetation Map, these mapping projects are the

Criteria	Additional Impact Assessment Provisions	Response
		most recent and comprehensive published mapping available and could be considered to be most accurate of the sources reviewed. Following a review of the above information for the extent of Cumberland Plain Woodland, both current and prior to European settlement, it is clear there is some variation in area calculations. It is noted however, that it is unanimously accepted by all sources that the community has suffered extensive clearing to a level that the community requires significant external intervention to maintain and recover the community within the Sydney Basin Bioregion. The estimated reduction in the geographic extent of Cumberland Plain Woodland since 1970 is not available in the TBDC, BioNet Vegetation Classification Database, the final determination or the recovery plan, and was not identified from a search of available literature. Nonetheless, the pre-European extent of Cumberland Plain Woodland is listed as approximately 125,449 ha within the Cumberland Plain Recovery Plan (DECCW 2011). No published data was found in the literature on the 1970 extent of Cumberland Plain Woodland and an accurate estimate of the reduction in distribution between the current extent and the 1970 geographic extent cannot be provided.
(b)	The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by:	According to the final determination for Cumberland Plain Woodland (NSW Scientific Committee 2009b), there has been a very large reduction in the ecological function of the community through processes such as:

Criteria	Additional Impact Assessment Provisions	Response
	i. Change in community structure ii. Change in species composition iii. Disruption of ecological processes iv. Invasion and establishment of exotic species v. Degradation of habitat; and vi. Fragmentation of habitat	• Extensive removal of large old trees; • Tree-felling for crops and pastures; • Fragmentation of habitat; • Grazing by livestock and rabbits; • Modification of understory, to be dominated by woody exotic species; • Soil chemical and structural modification associated with agricultural uses; • Changes in frequency of fire regimes; • Prevention of recruitment of species, through continued under-scrubbing and mowing; and • Reduction of understorey complexity, through the reduction of native shrub cover, resulting in degradation of habitat.
(c)	Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the: i. extent of occurrence ii. area of occupancy, and **iii.** number of threat defined locations	Paragraph 11 of the Final Determination for Cumberland Plain Woodland (NSW Scientific Committee 2009a) identifies that the community is restricted in geographic distribution to the Sydney Basin Bioregion, however it is noted that this is based on an estimated extant area of 2,810 km^2, which was established from outdated mapping undertaken by Tozer (2003). Based on current available information it is estimated that the current area of occupancy is between approximately 11,000 ha and 25,000 ha according to resources reviewed for Criteria 2(a). No threat defined location are specifically identified in the TBDC, however the ecological community is critically endangered across its

Criteria	Additional Impact Assessment Provisions	Response
		range. According to the Final Determination (NSW Scientific Committee 2009a), small, protected areas of the community exist in reserves such as Kemps Creek, Mulgoa and Windsor Downs, Scheyville National Park, and Leacock, Rouse Hill and Western Sydney Regional Parks.
(d)	Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	This principle is not identified as applicable to BDARs. It is noted that the TEC does respond to management, with several successful management measures outlined in the Best Practice Guidelines for Cumberland Plain Woodland (DEC 2005).
3	Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the assessor must record this in the BDAR.	Not applicable.
4 (a)	The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal: i. in hectares; and ii. as a percentage of the current geographic extent of the TEC in NSW	The proposal will remove approximately 0.09 ha of Cumberland Plain Woodland in the Subject Land and modify approximately 0.01 ha by removing the ground layer. However, it should be noted that the of the extent of the TEC to be removed in the Subject Land comprises scattered remnant or regrowth canopy trees, that occur over a ground layer of predominately mown, exotic grass species, with no persisting native shrub layer. The extent of the TEC in NSW differs depending on the information source. Based on a review of vegetation mapping layers, the estimated geographic extent in NSW is between approximately 11,000 ha and 25,000 ha according to resources reviewed for Criteria 2(a). However, based on the existing literature, the lowest number quoted for the estimated geographic extent of Cumberland Plain Woodland is 11,054 ha (OEH 2011). However, it should be recognised that the estimation of the remaining extent of Cumberland Plain

Criteria	Additional Impact Assessment Provisions	Response
		Woodland in NSW (as outlined in Criteria 2(a) above) is likely to largely be based around mapped woodland areas, and not include grassland forms of the TEC, as derived native grassland is generally not mapped in the broad-scale mapping projects. It also does not include small patches of one to several trees within an urban setting, such as the vegetation within the Subject land. These trees for example are not mapped under any of the historical broad scale mapping schemes covering the Subject Land or the State Vegetation Type Map. As a result, it is likely the estimations in Criteria 2(a) would be much higher if areas of existing Derived Native Grassland (DNG) and fragments in urban areas were included. Based on the lower of the numbers outlined above (11,054 ha), the total extent of Cumberland Plain Woodland to be impacted by the project (~0.1 ha) is approximately 0.0009% of the current geographic extent of the TEC in NSW. It should be noted that the Cumberland Plain Woodland with canopy only, due to the high dominance of exotic grasses and herbs in the ground layer, and lack of a shrub layer, is only included as the TEC in this assessment on a precautionary basis, as the Final Determination does not contain any explicit statements that trees over an exotic dominated ground layer conform to the community, although it does state the opposite in that areas of native dominated grassland without a canopy conform to the community. The occurrences within the Subject Land are not mapped within regional mapping schemes, due to small size of patches, and occurrence in urban areas, and similar areas of scattered remnant trees are unmapped across the Cumberland Plain. If all such patches

Criteria	Additional Impact Assessment Provisions	Response
		of the same condition state in NSW were mapped as the TEC and included in the total extent remaining in NSW, the estimation for the remaining extent of Cumberland Plain Woodland in NSW would be much higher and the percentage of the TEC to be impacted by the project would be much lower than what is detailed above.
(b)	The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:	-
	i. Estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500m of the development footprint or equivalent area for other types of proposals	Based on the NSW State Vegetation Type Map, there is approximately 0.23 ha of Cumberland Plain Woodland within 500 m of the Subject Land, occurring as two small patches within the ground of the adjacent Bonnyrigg Public School. However, as mentioned above, it should be recognised that the mapping in the 500 m of the Subject Land only maps some of the larger patches in the area. None of the vegetation mapped by Cumberland Ecology in the Subject Land is included for example, and as such there is likely to be small patches comprising one to several remnant trees occurring throughout urban areas within 500m. Within 600m of the Subject Land there is a larger ~2 ha patch of the community within Thesiger Park. The project is not likely to result in the isolation of an area of Cumberland Plain Woodland from other areas of the community, as all areas of the TEC with 500m are already highly fragmented and isolated in an urban matrix of development and planted vegetation.

Criteria	Additional Impact Assessment Provisions	Response
	ii. Describing the impacts on connectivity and fragmentation of the remaining areas of the TEC measures by:	-
	▪ Distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and	The distance between the Cumberland Plain Woodland occurrence within the Subject Land and the nearest discreet remnants of the TEC within the grounds of Bonnyrigg Public School is approximately 65 m. This will not change with removal of vegetation in the Subject Land as the Cumberland Plain Woodland patch in the south-west of the Subject Land will be retained.
	▪ Estimated maximum dispersal distance for native flora species characteristic of the TEC, and	The main dispersal mechanisms for flora species associated with Cumberland Plain Woodland include one or a combination of the following: • animals, • wind, • water runoff, and • gravity. Eucalypts within the community are likely to rely on animal assisted dispersal by highly mobile vertebrate pollinators (birds and bats) which disperse pollen over large areas when foraging (Southerton et al. 2003). The maximum dispersal distance for native flora species characteristic of the community is estimated to be at least 100 m and potentially much further. Based on the estimated distances between patches of the TEC following removal of vegetation within the Subject Land, the retained patch within the study area will remain within the dispersal distance

Criteria	Additional Impact Assessment Provisions	Response
		of surrounding offsite patches, however removal of some patches within the Subject Land will increase the distance between some patches in the locality. Prior to removal the northern and southern patches within the Subject Land are located over 150 m from each other, and dispersal between these areas is likely already limited.
	• Other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development	The occurrence of Cumberland Plain Woodland within the Subject Land already occurs as highly isolated occurrences of the TEC, with other patches of the TEC occurring in surrounding areas as scattered patches of isolated trees. The project will therefore not increase the fragmentation of this TEC however it will reduce the extent of the TEC within the Subject Land by 0.09 ha.

	Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.	The Cumberland Plain Woodland in the Subject Land corresponds to PCT 3320 Zone 1 Canopy. It should be noted that the majority of trees recorded within the 20x50 BAM plot contributing to the VI score are planted native trees, and not CPW species. The vegetation integrity score for the TEC is as follows:
		• Zone 1 Canopy: Vegetation Integrity Score: 29.2
		  ○ Composition: 23
		  ○ Structure: 20.8
		  ○ Function: 51.8

5	The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.	Not applicable.

9.3. Impacts that Require an Offset

9.3.1. Native Vegetation

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

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

The PCT and vegetation zone requiring offsets are documented in **Table 19**. These areas are mapped in **Figure 12**.

Table 19 Summary of impact to native vegetation requiring an offset

Vegetation Zone	PCT	Condition Name	MZ	Area (ha)	Patch Size Class	Vegetation Integrity Score	Credit
1	3320: Cumberland shale plains woodland	Canopy	1_Complete Removal	0.09	25-<100	28.2	2
			2_Ground Removal	0.01			

MZ=Management Zone

9.4. Impacts that do not Require an Offset

In accordance with the BAM, no offsets are required for impacts on 1.63 ha of Planted Native Vegetation, as these were not assigned to a PCT as per Appendix D of the BAM.

9.5. Impacts that do not Require Further Assessment

All areas identified as 'Exotic Woody Vegetation', 'Exotic Dominated Grassland', 'Retained Trees and Canopy' (where only the ground layer of exotic dominated grassland is being removed), and 'Hardstand' that occur within the Subject Land do not require further assessment. These areas comprise approximately 5.19 ha, as shown on **Figure 12**.

9.6. 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 20**, whilst the 'like for like' offsetting options for the ecosystem credits are provided in **Table 21**. A credit summary report from the BAMC has been included in **Appendix C**.

The credit offset liability is proposed to be satisfied through purchase of biodiversity credits or payment into the Biodiversity Conservation Fund.

Table 20. Summary of ecosystem credit liability

PCT #	PCT Name	TEC	Area (ha)	Credits Required
3320	Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion – Critically Endangered Ecological Community	0.1	2

Table 21. Like for like offsetting options for PCT 3320

Any PCT with the below TEC	Containing Hollow-bearing Trees?	In the below IBRA Subregions
Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	No	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometres of the outer edge of the impacted site.

10. Conclusion

This BDAR has been prepared to assess the impacts of the Project on biodiversity values, in accordance with the BAM. The Subject Land is largely cleared of the original native woodland vegetation. The project involves the demolition of existing structures, removal of vegetation, earthworks and road works, consolidation and subsequent subdivision to develop 4 superlots, and recreation areas, and required infrastructure.

Native vegetation occurring within the Subject Land includes occurrences of Cumberland Plain Woodland CEEC (approximately 0.1 ha, of which approximately 0.09 ha will be completely removed, and 0.01 ha will have the ground layer removed only), and Planted Native Vegetation. The remainder of the Subject Land comprises areas of Exotic Woody Vegetation Exotic Dominated Grassland (mown lawns), residential dwellings, and associated road and footpath infrastructure.

As the project includes the removal of an area of native vegetation, offsets are required in the form of ecosystem credits. This assessment indicates that the removal of the native vegetation within the Subject Land requires a total of 2 ecosystem credit of PCT 3320.

No threatened flora species that are considered as species credit species were recorded within the Subject Land and there is no habitat considered to be present for species credit species.

Measures to avoid and minimise impacts to the biodiversity values of the Subject Land have been implemented and include consideration of the Project location and design. However, when considering the requirements of achieving commitments to affordable and social housing, under and approved Concept Plan, opportunities to avoid all impacts on Cumberland Plain Woodland are limited. Nonetheless, 0.01 ha of Cumberland Plain Woodland (Zone 1_3320_Canopy) will be retained in the Subject Land, and further areas will be retained if feasible under future DAs for development within the superlots.

Further impacts of the project may entail potential indirect impacts, including inadvertent impacts on adjacent habitat and reduced viability of adjacent habitat due to noise, dust or light spill, and prescribed impacts such as impacts to non-native vegetation, impacts to man-made structures, increased risk of vehicle strike on threatened fauna, and impacts on habitat connectivity.

A suite of mitigation measures is proposed to minimise and manage the impacts to biodiversity values, such as tree protection measures, weed management, pre-clearance surveys, clearing supervision, replacement of removed hollows with nest boxes, and sediment management.

Although the occurrences of the TEC within the Subject Land will be reduced as part of the project, the impacts are limited to low quality, highly fragmented patches, which do not function as a natural ecosystem. With the implementation of the proposed mitigation measures and the offsetting described previously, it is considered that the impacts of this project on biodiversity values in general and Cumberland Plain Woodland in particular, will be minor and able to be managed appropriately as outlined in this BDAR.

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APPENDIX A :
BAM Plot Data

Table 22 BAM plot data used in the BAMC for the relevant vegetation zones

plot	pct	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	3320	Canopy	2	0	4	5	0	1	25	0	2.7	0.9	0	0.1	2	0	29	0	0	0	1	1	1	0	15.6

APPENDIX B :

BAM Plot Field Datasheets

Plot 1 in BDAR

Date: 12/12/2023	Project #: IB123	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BF	Plot ID: P 4 (1 in BAM)	Start:	11	304845	6248205	
Photos: 660 - 663	Orientation (°): 126	End:	12	305039	6248516	
Dimensions: ☑20x20, ☐10x40	PCT: 3020 126					Sheet: 1 of 2

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Flacourt. jangomas	5	1				
2	Eucalyptus Ribbiose	20	1				
3	Eucalyptus moluccana	5	0				
4	Cynodon dactylon	30	3000				
5	Einadia trigonos	0.5	30				
6	Micro sth sp.	1	100				
7	Cyperus gracilis	1	1000				
8	Oxalis perennans	0.1	30				
9	Modiola caroliv.	0.25	40				
10	Priechlaena pseud.	0.5	50				
11	Ehrharta erecta	10	1000				
12	Polycarpon tetra	0.1	20				
13	Bidens subalt.	0.2	10				
14	[redacted]						
15	Solanum laxum	0.25	1				
16	Bromus catharticus	0.1	10				
17	Taraxacum offic.	0.1	30				
18	Lolium perenne	1	100				
19	Portulacaria afra	1	5				
20	Corymbia [redacted] citriodora	15	2				
21	Commelina cyanea	0.1	1				
22	Hypochaeris albiflora	0.1	5				
23	Solanum nigrum	0.1	1				
24	Lepidium bonariense	0.1	1				
25	Paspalum dilatatum	0.2	20				
26	Paronychia brasi.	0.1	10				
27	Comphrena celos.	0.1	2				
28	Schefflera arbori.	0.5	1				
29	Coleonema pulch.	0.3	1				
30	Agapanthus praecox subsp. orient	0.25	2				
31	Richardia stellaris	0.1	30				
32	Eragrostis curvif.	5	200				
33	Oxalis corni.	0.1	10				
34	Carex inversa	0.2	100				
35	Dichondra repens	0.1	20				
36	Glycine tabacina	0.1	1				
37	Sida rhomb	0.1	1				
38	Sporob. africanus	0.1	3				
39	Medicago polym.	0.1	5				
40	Gamochaeta purpur.	0.1	10				

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**
Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: **TG**=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other
Stratum: **C** = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: 0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²

Plot 1 in BDAR

Date: 12/12/2023	Project #: 23/23	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: BE,	Plot ID: P 4 (1 in BAM)	Start:				
Photos:	Orientation (°):	End:				
Dimensions: □20x20, □10x40	PCT: CPW-3328					Sheet 2 of 2

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Elesine trist.	0.1	10				
2	Portulaca oleracea	0.1	3				
3	Conchrus olyra	0.2	5				
4	Hypoch radic.	0.1	10				
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Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**

Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other

Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

Plot 2 in BDAR

Eastings + Northings Swap

Date: 26/09/2023	Project #: 230123	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: CF, BC.	Plot ID: P 1	Start:		142030507	6248265	
Photos:	Orientation (°):	End:		141030504	6248262	
Dimensions: ☒20x20, □10x40	PCT: Exotic dominated grassland					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	~~Cynodon dactylon~~	~~90~~	~~9000~~				
2	Hypochaeris glabra	0.1	10				
3	Conyza bonariensis	0.1	2				
4	Poa annua	1	100				
5	Trifolium repens	0.5	50				
6	Medicago polymorpha	0.5	50				
7	Euchiton sphaericus	0.1	1				
8	Sporobolus africanus	0.5	50				
9	Plantago lanceolata	0.1	5				
10	Eragrostis ~~curvula~~ brownii	1	100				
11	Chloris truncata	2	200				
12	Cenchrus clandestinus	90	9000				
13							
14							
15							
16							
17							
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36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**

Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other

Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

Plot 3 in BDAR

Date: 26/09/2023	Project #: 23423	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: CF, BC	Plot ID: P 2	Start:	143	0304945	6248401	
Photos: _____	Orientation (°):	End:	144	0304951	6248504	
Dimensions: □20x20, ~~□10x40~~	PCT: Planted Native Veg					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Eucalyptus microcorys	40	7				
2	Eucalyptus sideroxylon	15	4				
3	Eucalyptus haemastoma	5	1				
4	Plantago lanceolata	0.1	10				
5	Cynodon dactylon	20	2000				
6	Eragrostis curvula	0.5	50				
7	Corymbia maculata	1	1				
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
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34							
35							
36							
37							
38							
39							
40							

Cover (%): 0.1, 0.2, 0.3...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**

Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other

Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

Plot 4 in BDAR

Date: 26/09/2023	Project #: 23123	Location	Waypoint	Easting	Northing	cumberland ecology
Personnel: CF, BC,	Plot ID: P3	Start:	146	0305027	6248487	
Photos: _____ - _____	Orientation (°):	End:	145	0305066	6248454	
Dimensions: ~~□~~20x20, □10x40	PCT: Exotic / Urban Garden Veg					Sheet: 1 of 1

	Species	Cover	Abundance	N, E, HTE	GF Group	Stratum	Voucher
1	Morus alba	20	1				
2	Fraxinus sp.	10	2				
3	Ulmus parviflora	40	1				
4	Hypochaeris radicata	0.5	50				
5	Medicago polymorpha	0.5	50				
6	Cenchrus clandestinus	90	9000				
7	Modiola caroliniana	0.5	50				
8	Plantago lanceolata	0.1	10				
9	Ehrharta erecta	1	100				
10	Bromus catharticus	1	100				
11	Sonchus oleraceus	0.1	10				
12	Conyza bonariensis	0.1	5				
13	Oxalis perrenans	0.1	5				
14	Gamochaeta americana	0.1	5				
15	Cardimine hastula.	0.1	10				
16	Bidens pilosa	0.1	5				
17	Rumex brownii	0.1	5				
18							
19							
20							
21							
22							
23							
24							
25							
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36							
37							
38							
39							
40							

Cover (%): **0.1, 0.2, 0.3**...etc. up to **1, 2, 3**...etc. up to **10, 15, 20, 25**...etc. up to **100**

Abundance (Count): **1, 2, 3**... up to **10, 20, 30**...up to **100, 200**... up to **1,000**...etc.

GF Group: TG=Tree, **SG**=Shrub, **GG**=Grass, **FG**=Forb, **EG**=Fern, **OG**=Other

Stratum: C = Canopy, **SC** = Sub-canopy, **S** = Shrub, **G** = Ground

Cover Note: *0.1% = approx 63 cm² or circle with 71cm diameter, 0.5% = approx 1.4m², 1% = approx 2m², 5% = approx 4.5m², 25% = approx 10m²*

Date: 12/12/2023	Project #: 23123	cumberland ecology
Personnel: BF	Plot ID: P 4 (1 in BAM c) Plot 1 in BDAR	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☑ Yes ☐ No	1	
50-79 cm	☑ Yes ☐ No	1 E. gran	
30-49 cm	☑ Yes ☐ No		
20-29 cm	☑ Yes ☐ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]					Bare Ground Cover (%)					Cryptogram Cover (%)					Rock Cover (%)				
1 x 1m Score[8]	20	30	40	20	35	80	5	10	–	–	–	–	–	–	–	–	–	–	–	–
Average Score																				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Date: 26/09/2023	Project #: 23123	cumberland ecology
Personnel: BC, CF, __	Plot ID: P _1_ Plot 2 in BDAR	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☐ Yes ☑ No		
30-49 cm	☐ Yes ☑ No		
20-29 cm	☐ Yes ☑ No		
10-19 cm	☐ Yes ☑ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	n/a

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m) 5 15 25 35 45

Subplot	Litter Cover (%)[9, 10]					Bare Ground Cover (%)					Cryptogram Cover (%)					Rock Cover (%)				
1 x 1m Score[8]	7	5	3	9	5	30	7	5	–	–	–	–	–	–	–	–	–	–	–	–
Average Score	5.8					8.4					-					-				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (< 10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Exotic dominated grassland
20 x 20 m flora
20 x 50m overall

- well maintained, mown lawn. Apart of a reserve.

Date: 26/09/2023	Project #: 23123	cumberland ecology
Personnel: BC, CE, __	Plot ID: P _2_ Plot 3 in BDAR	

Large Trees / Stem Classes / Hollows

DBH[1]	Stem Class Present[2]	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☑ Yes ☐ No	111	
30-49 cm	☑ Yes ☐ No		
20-29 cm	☑ Yes ☐ No		
10-19 cm	☑ Yes ☐ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	n/a

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m)

Subplot	Litter Cover (%)[9, 10]					Bare Ground Cover (%)					Cryptogram Cover (%)					Rock Cover (%)				
1 x 1m Score[8]	85	15	5	90	20	5	20	90	10	5	-	-	-	-	-	-	-	-	-	-
Average Score	43					26					-					-				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (< 10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

Planted
10 x 40m flora
10 x 100m plot overall
*4207

- some areas no lawn, bare ground
- understorey is mown lawn, well maintained

Date: 26/09/2023	Project #: 23123	cumberland ecology
Personnel: BC, BB, CE	Plot ID: P_3_ Plot 4 in BDAR	

Large Trees / Stem Classes / Hollows * Exotic trees

DBH[1]	Stem Class Present[2] *	Stem Class Count[2, 3]	Hollow-bearing Tree Count[4]
80+ cm	☐ Yes ☑ No		
50-79 cm	☑ Yes ☐ No	1	
30-49 cm	☑ Yes ☐ No		
20-29 cm	☑ Yes ☐ No		
10-19 cm	☑ Yes ☐ No		
5-9 cm	☐ Yes ☑ No		
<5 cm	☐ Yes ☑ No		
Are there hollow-bearing trees within the zone?[5]			☐ Yes ☑ No

1. DBH measured at 1.3m above ground.
2. Only living, native, tree species are to be recorded.
3. Exact stem counts must be provided for stems in the following classes: 50-79cm and 80+ cm (or additional classes for a PCT which has a smaller large tree threshold – e.g. heathlands). Include estimates of stem counts of other classes where there is extensive regeneration.
4. Hollow-bearing trees include living and dead native species allocated to the tree and shrub growth form groups. Hollow-bearing trees rooted within the plot with hollows that are visible from the ground must be included.
5. Where there are no hollow-bearing trees within a plot, but they are present within the vegetation zone, a value of 1 is to be entered in the BAMC.

Logs

Length of logs[6, 7]	(≥10cm diameter, >50cm in length)
Tally	
Total (m)	0/9

6. Dead native and exotic species recorded.
7. Logs must be entirely or partially on the ground within the plot, and only the length within the plot is recorded.

Subplots (1x1m) 5 15 25 35 45

Subplot	Litter Cover (%)[9, 10]					Bare Ground Cover (%)					Cryptogram Cover (%)					Rock Cover (%)				
1 x 1m Score[8]	3	80	5	2	7	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average Score	19.4					0.4					-					-				

8. Scores must be provided for litter cover. Include scores for other variables where supplementary information is required.
9. Litter includes leaves, seeds, twigs, branchlets and branches (<10cm diameter) from native and exotic species.
10. Must include all plant material detached from a plant and forms part of the litter layer on the ground surface. Material that is not detached is assessed as growth form foliage cover.

Composition and Structure Summary

Attribute		Value
Count of Native Richness (Composition)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Native Cover (Structure)	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed Cover		

Additional Notes

- Exotic / urban garden veg
- well maintained, mown lawn understorey.
- Tree stem class present count is for EXOTIC species. All trees are exotic.
- # 4208

APPENDIX C :
BAM Credit Reports

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00044836/BAAS18095/23/00044837	Bonnyrigg Stage 12 and Stage 13	22/06/2023
Assessor Name	Report Created	BAM Data version *
Bryan Furchert	14/02/2024	61
Assessor Number	BAM Case Status	Date Finalised
BAAS18095	Finalised	14/02/2024
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

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

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

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

Cumberland Shale Plains Woodland												
1	3320_Canopy	Cumberland Plain Woodland in the Sydney Basin Bioregion	29.2	28.2	0.1	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	2
											Subtotal	**2**
											Total	**2**

Species credits for threatened species

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

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00044836/BAAS18095/23/00044837

Proposal Name
Bonnyrigg Stage 12 and Stage 13

BAM data last updated *
22/06/2023

Assessor Name
Bryan Furchert

Assessor Number
BAAS18095

BAM Data version *
61

Proponent Names

Report Created
14/02/2024

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
14/02/2024

BOS entry trigger
BOS Threshold: Area clearing threshold

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	3320-Cumberland Shale Plains Woodland

Species
Nil

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Ephippiorhynchus asiaticus / Black-necked Stork

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3320-Cumberland Shale Plains Woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.1	0	2	2

BAM Biodiversity Credit Report (Like for like)

3320-Cumberland Shale Plains Woodland	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 3319, 3320	-	3320_Canopy	No	2	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.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

FIGURES

Figure 1. Site map

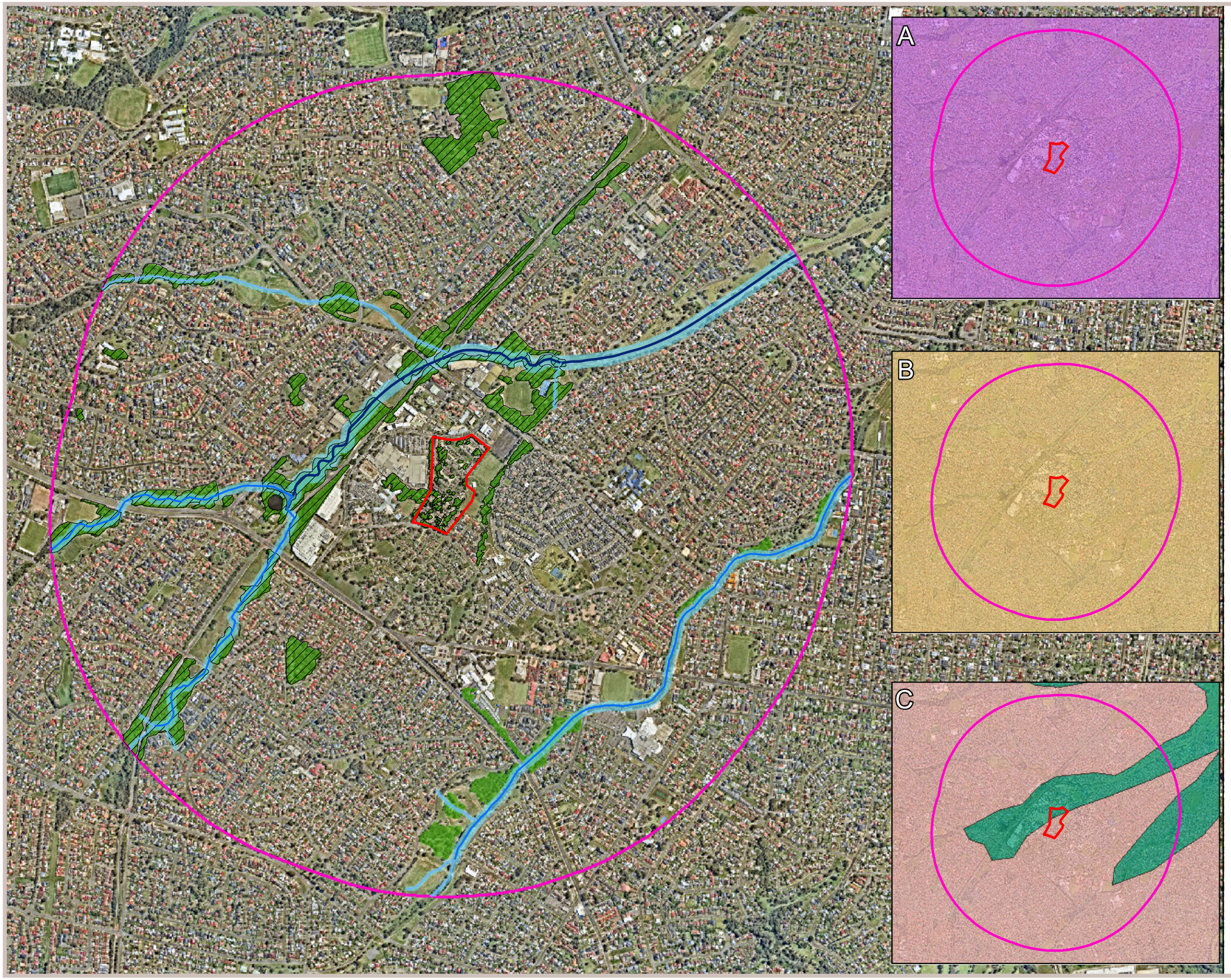

Figure 2. Location map

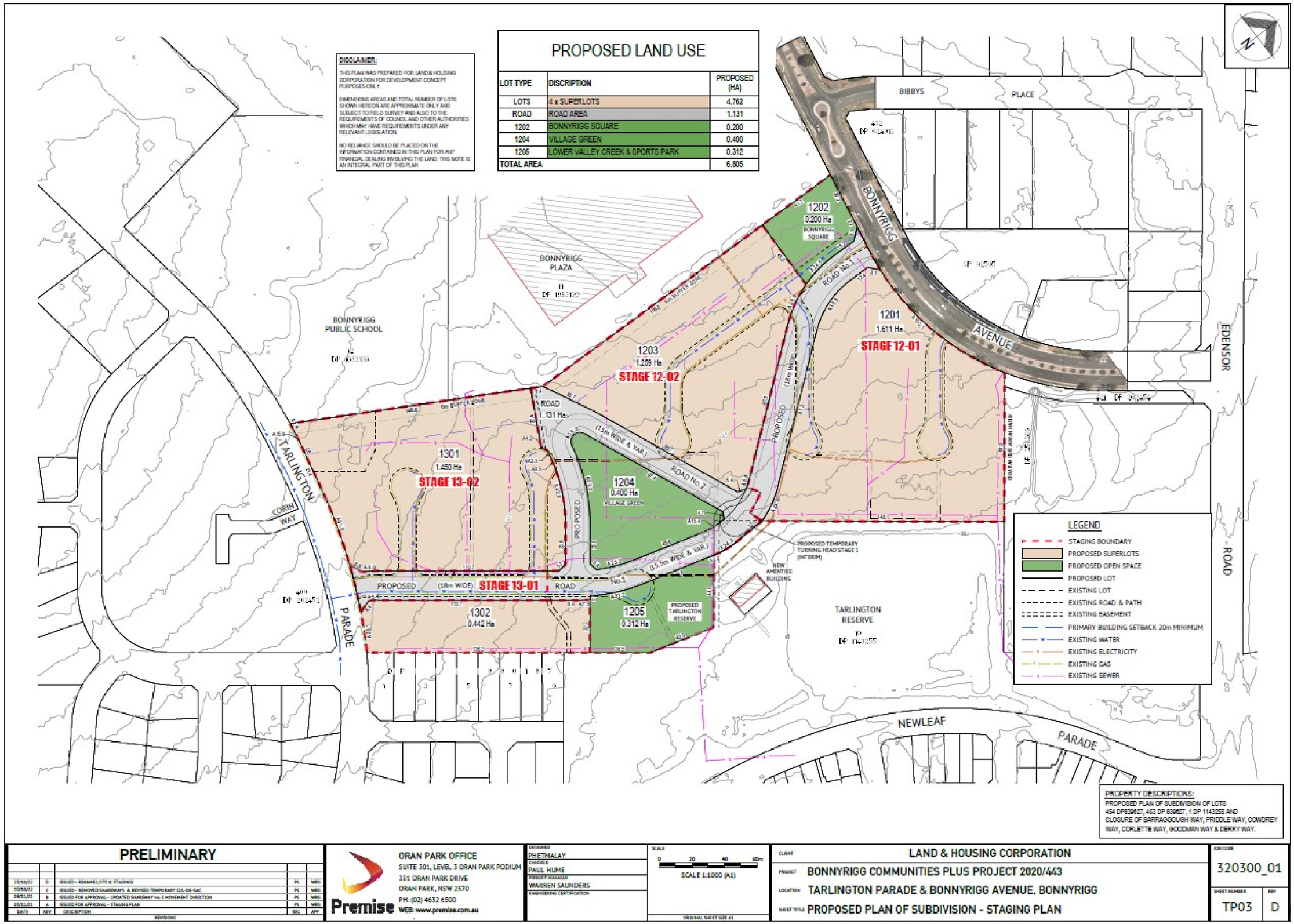

Figure 3. Layout of the Project

Image Source: Premise 2023

I:\...\23123\Figures\RP1\20231218\Figure 3. Layout

Legend

- Subject Land
- BAM Plot Locations
- Survey Tracks

Plant Community Type

- PCT 3320: Cumberland Shale Plains Woodland

Other Vegetation Types

- Planted Native
- Exotic Woody Vegetation
- Exotic Dominated Grassland
- Hardstand

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 3/2/2023

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I:\...\23123\Figures\RP1\20240129\Figure 4. Flora survey locations

Figure 4. Flora survey locations

0 50 m

Figure 5. Fauna survey locations

Figure 6. Native Vegetation Extent within the Subject Land

Figure 7. PCT Locations within the Subject Land

Legend

Subject Land

Vegetation Zone

Zone 1: 3320_Canopy

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 3/2/2023

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I:\...\23123\Figures\RP1\20240129\Figure 8. Vegetation Zones

0 50 m

Figure 8. Vegetation Zones within Subject Land

Legend

Subject Land

Vegetation Zone

Zone 1: 3320_Canopy

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 3/2/2023

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I:\...\23123\Figures\RP1\20240129\Figure 9. TECs

Figure 9. TECs within the Subject Land

0 50 m

Figure 10. Prescribed Impact Locations within the Subject Land

Legend

Subject Land

Serious and Irreversible Impact Entity

Cumberland Plain Woodland in the Sydney Basin Bioregion

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 3/2/2023

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I:\...\23123\Figures\RP1\20240129\Figure 11. TECs at risk of SAII Subject Land.mxd

Figure 11. TECs at risk of SAII Subject Land

0 50 m

Legend

- Subject Land
- Retained Trees and Canopy

Serious and Irreversible Impact Entity

- Cumberland Plain Woodland in the Sydney Basin Bioregion

Impacts that Require an Offset

- PCT 3320: Cumberland Shale Plains Woodland

Impacts Not Requiring an Offset

- Planted Native

Impacts Not Require Further Assessment

- Exotic Woody Vegetation
- Exotic Dominated Grassland
- Hardstand

Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © NearMap 2023
Dated: 3/2/2023

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I:\...\23123\Figures\RP1\20240129\Figure 12. Thresholds for Assessment

Figure 12. Thresholds for Assessment

0 50 m