Biodiversity Development Assessment Report

for

Stratford House Lifestyle Village

Tahmoor NSW 2573

Report prepared for Common Ground Property

January 2020

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Prepared for:	Common Ground Property
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Final v2.0	Biodiversity Development Assessment Report For Stratford House Lifestyle Village Tahmoor NSW 2573 Report prepared for Common Ground Property Pty Ltd	23 January 2020

Executive Summary

Land Eco Consulting Pty Ltd (Land Eco) was commissioned by Common Ground Property Pty Ltd. ('the proponent') to prepare this Biodiversity Development Assessment Report (BDAR) for the proposed development of a retirement village and aged care facility of "Stratford House", Tahmoor (Lots 1-7, and 22, 23 27-32, 35-37/-/DP12096, and Lots 2, 3 and 11/-/DP739884) (hereafter referred to as 'the Subject Land').

The development is subject to Wollondilly Council development application (DA) approval and has triggered the NSW Biodiversity Offset Scheme (BOS) and requires submission of a 'Part 4 General' Biodiversity Development Assessment Report (BDAR) due to the proposed removal of 'native vegetation' in excess of the clearing thresholds outlined in the Biodiversity Assessment Method (BAM). The BDAR is required to be undertaken by an accredited assessor to assess the impacts of the proposal.

This BDAR has been prepared by Land Eco to identify the potential impacts of the proposal on biodiversity values within the Subject Land. This assessment has been completed in accordance with the Biodiversity Assessment Method and includes:

- Detailed literature review and desktop assessment to describe the environment and landscape features of the Subject Land and to identify the suite of threatened biota potentially affected by the proposal;
- Site assessment to describe the biodiversity values of the Subject Land and to determine the likelihood of threatened biota and their habitats occurring within the proposed activity footprint;
- Targeted field surveys for a suite of candidate Species Credit species identified by the Biodiversity Assessment Method Calculator as likely to occur within the native vegetation of the Subject Land in accordance with the relevant NSW threatened species survey guidelines;
- Discussion and recommendation of measures to avoid and minimise impacts to biodiversity values;
- Discussion on impacts to biodiversity values including Serious and Irreversible Impacts; and
- Biodiversity Assessment Method calculations using the Biodiversity Assessment Method Calculator 1.2.7.2 to quantify the level of biodiversity impacts of the proposal following the implementation of measures to avoid and minimise impacts, and to determine the biodiversity credits that will need to be purchased and retired to offset the residual impacts of the proposal.

The Subject Land has been historically cleared and where canopy remnants remain, most of this has been under scrubbed. A substantial area located in the north-east is planted with ornamental trees, shrubs and groundcovers. The remaining majority of the Subject Land comprises historically cleared native grassland. The proposed development has been designed to minimise impacts on biodiversity values as far as practicable and requires the removal of approximately 11.3 ha of native vegetation.

The proposed development is expected to result in clearing and associated impact (11.3ha) to one distinct plant community type (PCT):

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

The area of PCT 1395 within the Subject Land comprises an occurrence of *Shale Sandstone Transition Forest in the Sydney Basin Bioregion*, which is listed as a Critically Endangered Ecological Community and Serious and Irreversible Impact (SAII) entity under the NSW *Biodiversity Conservation Act 2016*. This vegetated area consisted of three condition classes as follows:

- Condition Class 1: PCT 1395 Weed Infested Remnant (0.5 ha)
- Condition Class 2: PCT 1395 Canopy Remnant (3.8 ha)
- Condition Class 3: PCT 1395 Derived Native Grassland (6.5 ha)
- Condition Class 4 -PCT 1395 Exotic Dominant (0.5 ha)

Class 4 and Class 3 scored such low Vegetation Integrity Scores (VIS) that they require no assessment of threatened species habitat and will generate no offset obligation in accordance with the BOS.

The following Ecosystem Credits are required to be retired to offset the biodiversity impacts of the proposal:

- 146 Ecosystem Credits of PCT 1395-Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion (Shale Sandstone Transition Forest in the Sydney Basin Bioregion).

Once the proponent meets their offset obligations, the project will incur no significant or serious and irreversible impact upon Shale Sandstone Transition Forest in the Sydney Basin Bioregion.

The following Species Credits must be surveyed in order to confirm their absence from the Subject Land. The proponent desires to submit this BDAR to Council with their DA assuming that during the period of time that the DA is being assessed, the proponent will undertake targeted survey for the residual Species Credit species that could not be surveyed-for in the leadup to DA submission.

- 174 Species Credits of *Chalinolobus dwyeri* (Large-eared Pied Bat)
- 116 Species Credits of *Myotis macropus* (Southern Myotis)

In addition to offsetting, the *Biodiversity Conservation Act 2016* requires that an applicant takes all reasonable effort to avoid and minimise potential impacts of the proposal on local biodiversity values. A series of mitigation and management measures have been identified, which are to be implemented as part of any construction environmental management plan produced for the site. These include measures to:

- Ensure all contractors employed to work within the Subject Land are suitably qualified, experienced and informed of the sensitive ecological features and potentially occurring threatened species;
- Assign a Project Ecologist to conduct and oversee all ecological compliance requirements associated with conducting a proposed development in line with all relevant state and commonwealth legislation and guidelines;
- Have an ecologist present during the clearing of all vegetation both native and exotic related to the proposed activity;
- Incorporate locally indigenous flora species representative of Shale Sandstone Transition Forest in the Sydney Basin Bioregion in soft landscaping associated with the development wherever possible;
- Implement vertebrate pest control during construction and operation of the development;
- Implement all relevant biological hygiene protocols and requirements as per NSW Government guidelines.
- Ongoing management of priority weeds according to statutory requirements.
- Prescribed fencing and vegetation exclusion requirements.

During operation there is potential for the proposal to indirectly impact surrounding vegetation and habitat values through:

- Introduction of weed propagules by vehicle and increased edge effects.
- Increase in vertebrate pests, particularly Cat, Fox and Rabbit.
- Erosion and sedimentation as a result of runoff from hard stand areas.
- Generation of additional light and noise.

State Environmental Planning Policy No.44 has been assessed, and the Subject Land does not contain 'Potential' or 'Core' Koala Habitat. There is no need for a Koala Plan of Management.

The proponent is required to retire biodiversity offset credits in order to meet their obligations to offset the residual impacts of the proposed DA. The proponent may purchase and retire the appropriate credits from Biodiversity Stewardship Sites that comply with the trading rules of the BOS in accordance with the 'like for like' report generated by the Biodiversity Assessment Method Calculator (Section 9 – Biodiversity Credit Report). Alternatively, the proponent can meet their offset obligations by making a payment directly into the NSW Biodiversity Offsets Payment Fund.

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Glossary

Acronym/ Term	Definition
BAM	The NSW Biodiversity Assessment Method
BAMC	The NSW Biodiversity Assessment Method Calculator
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity Offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of development.
Biodiversity values	The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats.
BOS	NSW Biodiversity Offset Scheme
DA	Development Application
DCP	Development Control Plan
DPIE	NSW Department of Planning, Infrastructure and Environment
Ecosystem credit	A credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate).
EEC	Endangered Ecological Community
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
Ha	Hectare
THE	High Threat Exotic
Km	Kilometre
LEP	Wollondilly Local Environmental Plan 2011
LGA	Local Government Area
Locality	The area within a 10km radius of the Subject Land. The same meaning when describing a local population of a species or local occurrence of an ecological community.
M	metres
MNES	Matters of National Environmental Significance
Native Vegetation	means any of the following types of plants native to New South Wales:(a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland.
NSW	The State of New South Wales
OEH	NSW Office of Environment and Heritage (now known as Department of Planning, Infrastructure and Environment)
PCT	NSW Plant Community Type
Priority weed	Priority weed in the Greater Sydney Region as per the *Biosecurity Act 2015*
Proposal	The development, activity or action proposed.
SAII	Serious and Irreversible Impacts
SAII entity	Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs)
SEPP	State Environmental Planning Policy
Species Credit	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require Species Credits are listed in the Threatened Biodiversity Data Collection.
Study Area	The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the proposal.
Subject Land	The location of the proposed activity (development footprint); the subject of this report.
Subject Property	"Stratford House", Tahmoor (Lots 1-7, and 22, 23 27-32, 35-37/-/DP12096, and Lots 2, 3 and 11/-/DP739884)
The proponent	The developer of the property (Common Ground Property Pty Ltd)
Threatened biota	Threatened species, populations or ecological communities listed under the BC Act and/or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 and '*threatened species, population or ecological community*' means a species, population or ecological community specified in any of those Schedules.
VIS Plot	Vegetation Integrity Survey Plot

1. Introduction

1.1 Overview

Land Eco Consulting Pty Ltd (Land Eco) was commissioned by Common Ground Property Pty Ltd. ('the proponent') to prepare this Biodiversity Development Assessment Report (BDAR) for the proposed development of a retirement village and aged care facility of "Stratford House", Tahmoor (Lots 1-7, and 22, 23 27-32, 35-37/-/DP12096, and Lots 2, 3 and 11/-/DP739884) (hereafter referred to as 'the Subject Property') (**Figure 1**).

The Subject Property is located within the Wollondilly Council Local Government Area (LGA) and is subject to the planning provisions of the Wollondilly Council LGA, including the Wollondilly Council Local Environment Plan 2011 (LEP), Development Control Plan 2016 (DCP) and associated plans, policies and guidelines.

Land Eco have produced this report in order to address the principals of 'avoid, minimise and offset', to assess any potential impacts associated with the DA, and recommend appropriate measures to mitigate any potential ecological impacts in line with the requirements of the Wollondilly Council.

The development has triggered a '*Part 4 General*' BDAR due to the intended removal of 'native vegetation' in excess of the clearing threshold (0.25 hectares for the Subject Property) outlined in the Biodiversity Assessment Method (**Table 1**). Native vegetation clearing thresholds are determined based on the minimum lot size, or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP), of the property in which the development is situated.

Table 1. Area Clearing Threshold as per Biodiversity Offsets Scheme entry requirements (OEH 2018)

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	**0.25 ha or more**
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

1.2 Site Location and Description

The Subject Property is situated within the suburb of Tahmoor within the Wollondilly Local Government Area (LGA). The Subject Property is made up of 19 separate lots:

- 1//DP12096
- 2//DP12096
- 3//DP12096
- 4//DP12096
- 5//DP12096
- 6//DP12096
- 32//DP12096
- 23//DP12096
- 29//DP12096
- 28//DP12096
- 7//DP12096
- 37//DP12096
- 36//DP12096
- 35//DP12096
- 2//DP236262
- 3//DP236262
- 31//DP12096
- 30//DP12096
- 27//DP12096

The Subject Property covers approximately 13.9 ha and contains a heritage estate "Stratford House" surrounded by heritage, exotic-dominated gardens. The remainder of the property is managed woodland and historically cleared grasslands.

1.3 The Proposed Development

This BDAR relates solely to the development footprint, hereafter referred to as the 'Subject Land'. The Subject Land occupies the majority of the Subject Property, encompassing all developable areas (**Figure 1; Figure 2**).

The proposed development footprint is expected to cover an area of approximately 11.3 ha of vegetation.

Impacts to vegetation required to facilitate the proposed development are presented in **Table 2**.

Table 2. Impacts to vegetation to facilitate development

Vegetation type	Area to be removed (ha)
Remnant bushland - weed infested	0.5
Canopy remnant - under scrubbed	3.8
Derived native grassland	6.5
Exotic dominated grassland and gardens	0.5
Total	11.3

Land Eco have produced this report in order to assess any potential impacts associated with the DA and recommend appropriate measures to mitigate any potential ecological impacts in line with the requirements of the Consent Authority, Wollondilly City Council.

1.4 Avoid and minimise impacts (location and design)

The proposed development is a retirement village and aged care facility. It provides a much-needed facility and service for the ageing populations in the Macarthur region and greater Western Sydney. The location of the proposed development is optimal for this type of land use, as the land is not prone to bushfires or flooding.

The site was also chosen because it contained little remnant, intact bushland. Unlike other large lots in the region which contain more intact or 'good condition' bushland. The condition of the Subject Property was that of a historically cleared, under scrubbed and grazed property. In choosing this location the proponent actively reduced impacts to native vegetation and threatened species habitat.

The proponent explored the possibility of retaining remnant trees as part of the landscaping in the lifestyle village, however, it was deemed that the retention of large, mature *Eucalyptus spp.* including ironbarks and stringybarks would not be conducive to the intended land use of a retirement and aged care facility. Such trees drop limbs with little notice and can be dangerous to residents and their homes. Further, these trees carry fire in their canopy and, even though the site is not mapped bushfire prone land it could carry a bushfire in the right conditions. Because of this, most of the native trees present on the Subject Property will be removed to facilitate the proposed development. Residual impacts will be offset in accordance with the BOS and BAM as detailed in this BDAR Report.

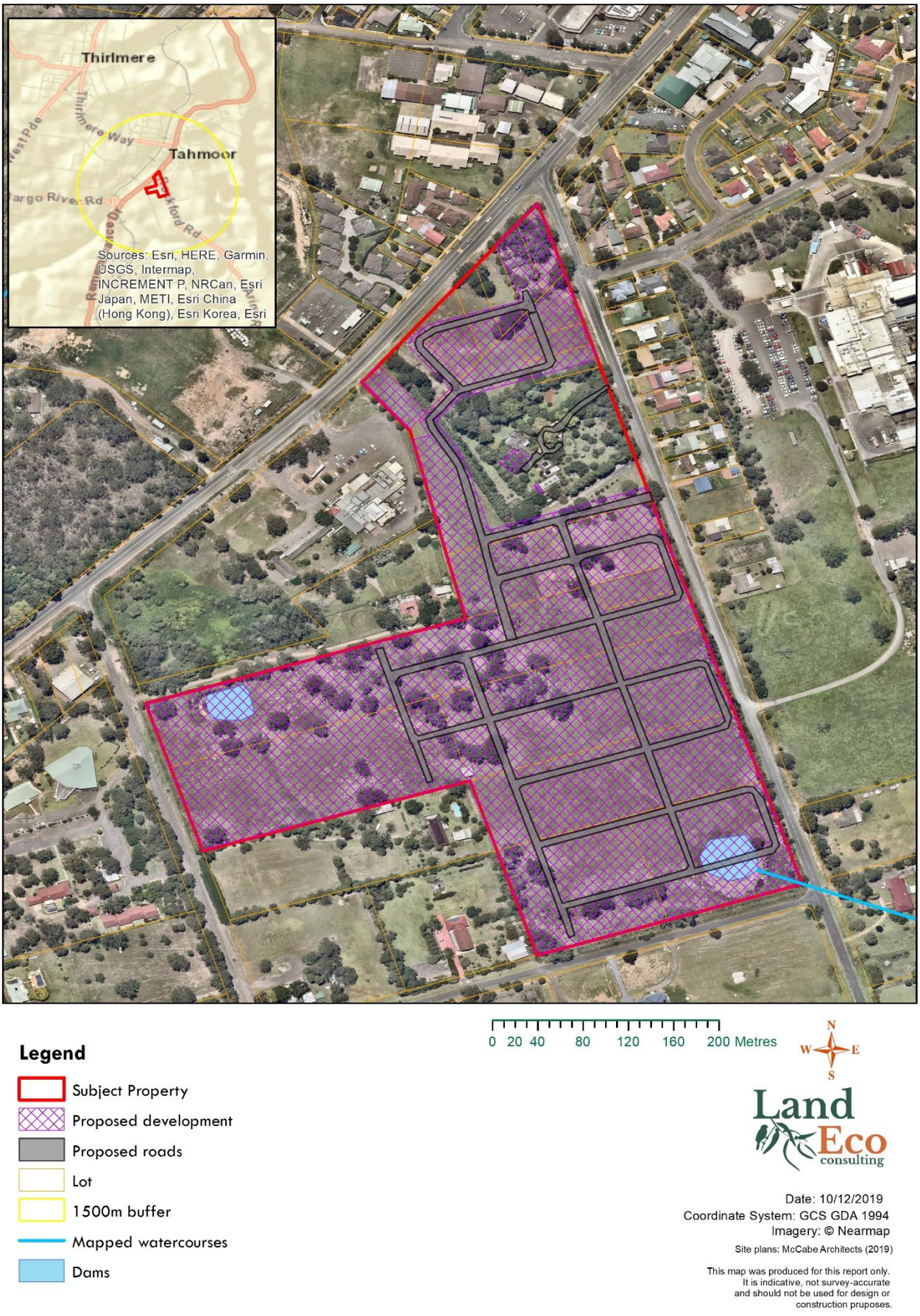

Figure 1. The location of the Subject Property and Subject Land

Figure 2. Proposed development (McCabe Architects 2019)

1.5 Sources of Information Used

A thorough literature review was undertaken to gain an understanding of the ecology within the locality and the Wollondilly LGA. Relevant data and literature reviewed in preparation of this report included:

- Relevant State and Commonwealth Databases:
    - NSW BioNet. The website of the Atlas of NSW Wildlife (DPIE 2019c)
    - Protected Matters Search Tool (DEE 2019)
- Relevant State and Commonwealth Datasets:
    - NSW Government Spatial Services: Six Maps Clip & Ship (Six Maps 2018)
    - NSW State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017
    - NSW State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44) 1995
- NSW Scientific Committee Final Determinations for:
    - Shale Sandstone Transition Forest in the Sydney Basin Bioregion – critically endangered ecological community listing NSW Scientific Committee – final determination (NSW Threatened Species Scientific Committee 2014)
- Vegetation Mapping:
    - Office of Environment and Heritage (2013) Remnant Vegetation of the western Cumberland subregion, 2013 Update. VIS_ID 4207
    - Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands (Tozer et al. 2010)
- NSW State Guidelines:
    - Biodiversity Assessment Method Calculator (BAMC) (OEH 2019c);
    - BioNet Threatened Biodiversity Data Collection (TBDC) (DPIE 2019c);
    - Threatened Species Survey and Assessment: Guidelines for developments and activities. Working Draft (DEC 2004)
    - NSW Guideline to Surveying Threatened Plants (OEH 2016b)
    - Guidance to assist a decision-maker to determine a serious and irreversible impact (OEH 2017b)
    - Biodiversity Offsets and Agreement Management System (BOAMS)
- Commonwealth Guidelines:
    - Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2010)
    - Survey guidelines for Australia's threatened orchids. Guidelines for detecting orchids listed as 'threatened' under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia 2013)
- Council Documents:
    - Wollondilly Local Environmental Plan (LEP) 2014
    - Wollondilly Development Control Plan (DCP) 2014
    - Priority weeds for the South East (Wollondilly Council) (DPI 2019)

Preparation of this BDAR also involved the review of the following accompanying project documents:

- Concept Yield Diagram – Stratford Park Lifestyle Residences, Tahmoor (McCabe Architects 2019)

Online databases and literature reviews were utilised to gain an understanding of the natural environment and ecology of the Subject Land and its surrounds. Searches utilising NSW Wildlife Atlas (BioNet) (DPIE 2019c) and the Commonwealth Protected Matters Search Tool (DEE 2015) were conducted to identify. Threatened flora and fauna, including any Migratory fauna, records within a 10km² search area centred on the Subject Land. The data was used to assist in establishing the presence or likelihood of any such ecological values as occurring on or adjacent to the Subject Land and help inform our Ecologists on what to look for during the site assessment.

Soil landscape and geological mapping was examined to gain an understanding of the landforms present within, and surrounding, the Subject Land. This assists in determining whether any Threatened flora or ecological communities may occur.

1.6 Aim and Approach

This report has been prepared in accordance with the Biodiversity Assessment Method (OEH 2017a) and aims to:

- Describe the biodiversity values present within the Subject Land and surrounding area, including the extent of native vegetation, vegetation integrity and the presence of threatened ecological communities (TECs);
- Determine the habitat suitability within the Subject Land for candidate threatened species;
- Prepare an impact assessment in regard to potential impacts of the proposed development on biodiversity values, including potential prescribed impacts and serious and irreversible impacts (SAIIs) within the Subject Land;
- Discuss and recommend efforts to avoid and minimise impacts on biodiversity values; and
- Calculate the biodiversity credits (i.e. ecosystem credits and Species Credits) that measure potential impacts of the development on biodiversity values. This calculation will inform the decision maker (Wollondilly) as to the number and class of offset credits required to be purchased and retired as a result of the proposed development.

1.7 IBRA Bioregions and Subregions

The Subject Land occurs within the 'Sydney Basin' Interim Biogeographic Regionalisation for Australia (IBRA) bioregion, and 'Cumberland' IBRA subregion (DEE 2016; **Figure 3** and **Figure 4**).

1.8 Mitchell Landscapes

NSW Landscapes Mapping: Background and Methodology (Mitchell 2002) groups ecosystems into meso-ecosystems representing larger natural entities based on topography and geology. The naming of ecosystems and meso-ecosystems was standardised so that each name provided location information and a meaningful descriptive landscape term. The Subject Land occurs within the '*Picton Razorback Hills*' Mitchell Landscape Ecosystem (**Figure 4**).

1.8.1 Landscape Ecosystem – Picton - Razorback Hills

Plateau ridge with steep slopes on horizontal upper Triassic shale, carbonaceous claystone, and lithic sandstone, subject to extensive earthflows on slopes above 120, general elevation 180 to 300m, local relief 90m. Harsh, red, brown or yellow texture-contrast soils with reactive clay subsoils (Mitchell 2002).

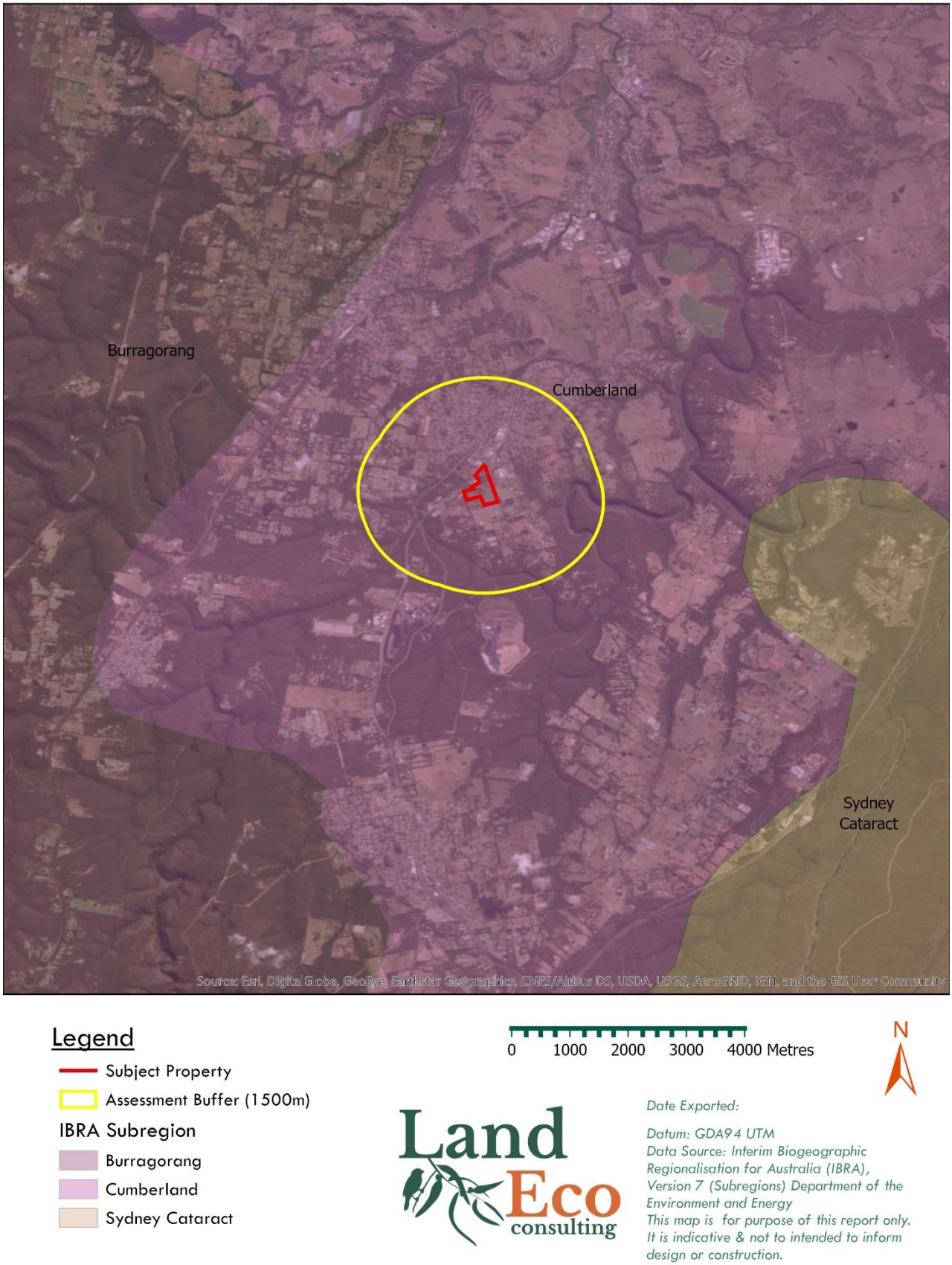

Figure 3. The assessment buffer surrounding the Subject Land lies entirely within the Cumberland IBRA 7 Subregion of the Sydney Basin IBRA7 Bioregion.

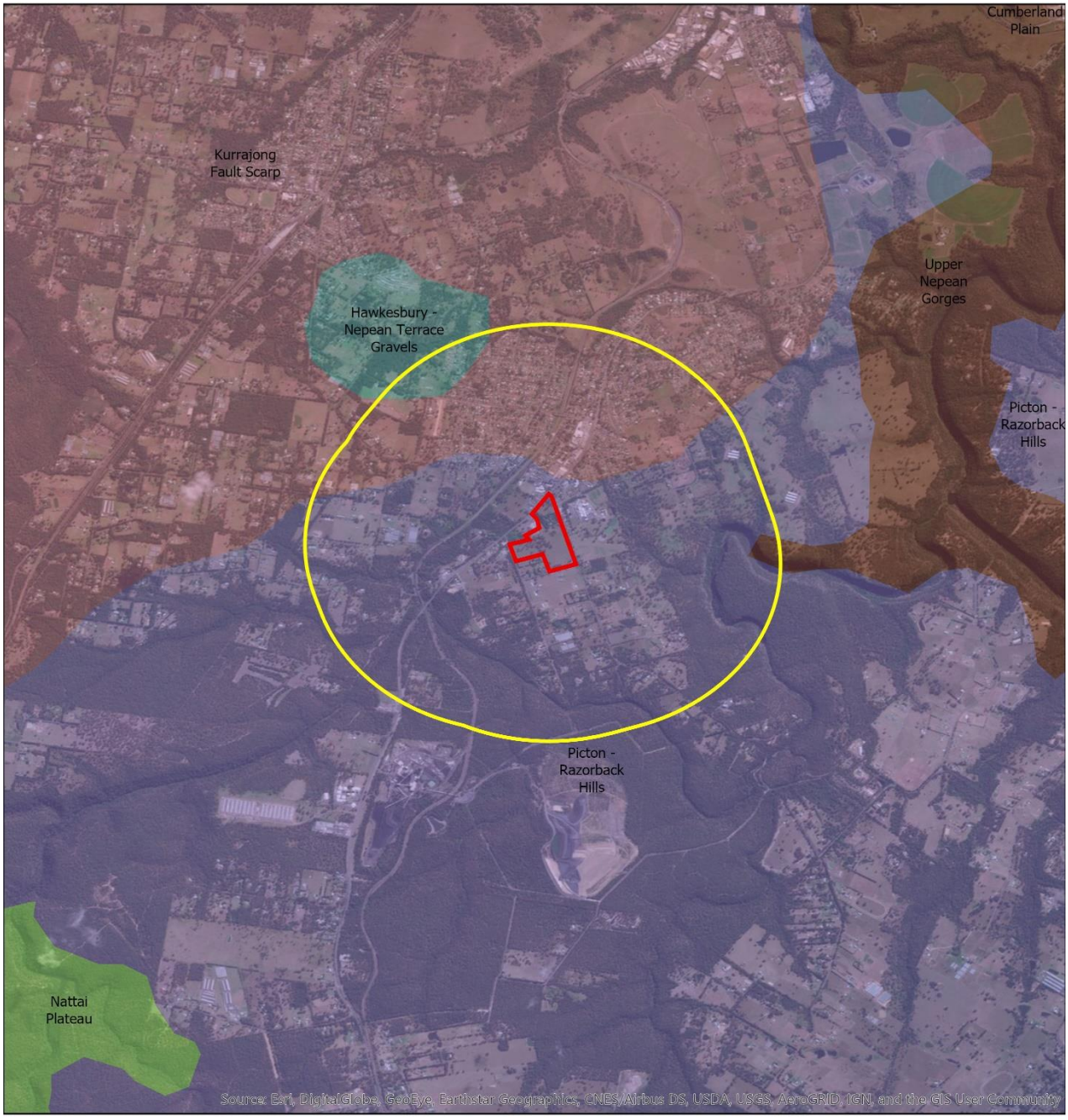

Figure 4. The Mitchell Landscapes that comprise the Subject Land and the surrounding assessment area.

1.9 Landscape features

This section details the landscape features and associated habitat values in and around the Subject Land. A table is provided which details the Landscape Features as required by the BAM (**Table 3**).

1.9.1 Topography, geology and soils

The Subject Land is situated on a south-facing aspect, where the elevation ranges from 269 m above mean sea level (AMSL) at the corner of Stratford Road and Remembrance Drive, to 280 m AMSL near the north-east corner of the Subject Land.

The Subject Land is situated within the 'Lucas Heights' Soil Landscape which is typically characterised by gently undulating crests, ridges and plateau surfaces of the Mittagong Formations, with alternating bands of shale and fine-grained sandstones (Bannerman and Hazelton 1990). The Mittagong Formation is located stratigraphically between the Ashfield Shale and Hawkesbury Sandstone, with minor areas of Hawkesbury Sandstone and Ashfield Shale sporadically forming surface soil materials (Stroud et al. 1985; Bannerman and Hazelton 1990).

Soils on crests and slopes comprises loose greyish brown fine sandy loam (soil lh1) overlaying sandy clay loam (soil lh3) (Bannerman and Hazelton 1990). Crests and plateaus usually have 10-20 cm of hard-setting loam (soil lh2) overlaying yellow pedal clay (soil lh4), while valley flats and depressions consist predominantly of soil lh1 (Bannerman and Hazelton 1990).

1.9.2 Hydrology

Hydrographic mapping (SIX Maps 2019) of the Subject Property, indicates the presence of a minor 1st order stream as occurring within the southern portion of the Subject Land. In addition, two (2) small dams occur within the Subject Land, one adjoining the stream, and another situated on the north-west section of the Subject Land. Upon site assessment, the minor 1st order stream was not located within the south-eastern area of the Subject Land; thus, it is assumed that this stream is ephemeral (**Figure 5;Figure 6**).

Table 3. Landscape features identified within the Subject Land and surrounding 1500m buffer.

Landscape Feature	Identification of Landscape Feature on Site
Native vegetation extent in 1500m buffer area	A 1500m 'assessment circle' surrounding the outside edge of the boundary of the Subject Land was prepared in order to determine the extent of native vegetation within the surrounding locality of the Subject Land. Native vegetation was considered to cover approximately 831ha of the total 989ha area within the assessment circle, this corresponds with the >70% class (**Figure 8**).
Rivers and Streams (classified according to stream order)	No mapped watercourses occur within the Subject Land (**Figure 5**). A number of mapped watercourses occur within the 1500m buffer of the Subject Land (**Figure 6**). The watercourses range from 1st order streams to 3rd order streams and are tributaries of Bargo River which flows into the Nepean River.
Wetlands (within, adjacent to and downstream of site)	The Subject Land and the surrounding area (within the 1500m buffer) do not contain any areas of native vegetation identified as 'Coastal Wetlands' as per the State Environmental Planning Policy (Coastal Management) 2018.
Connectivity features	The identified area of habitat connectivity between the Subject Land and native vegetation within the 1500m buffer zone has the potential to provide habitat for a number of threatened species, endangered populations and migratory species. There is the potential that 'flyways' used by a suite of both terrestrial and migratory avian species encompass the Subject Land as well as a land within the 1500m buffer zone.
Areas of geological significance and soil hazard features	No areas of geological significance (karsts, caves, crevices or cliffs) were identified within the Subject Land. This was determined as a result of a comprehensive site-based assessment.

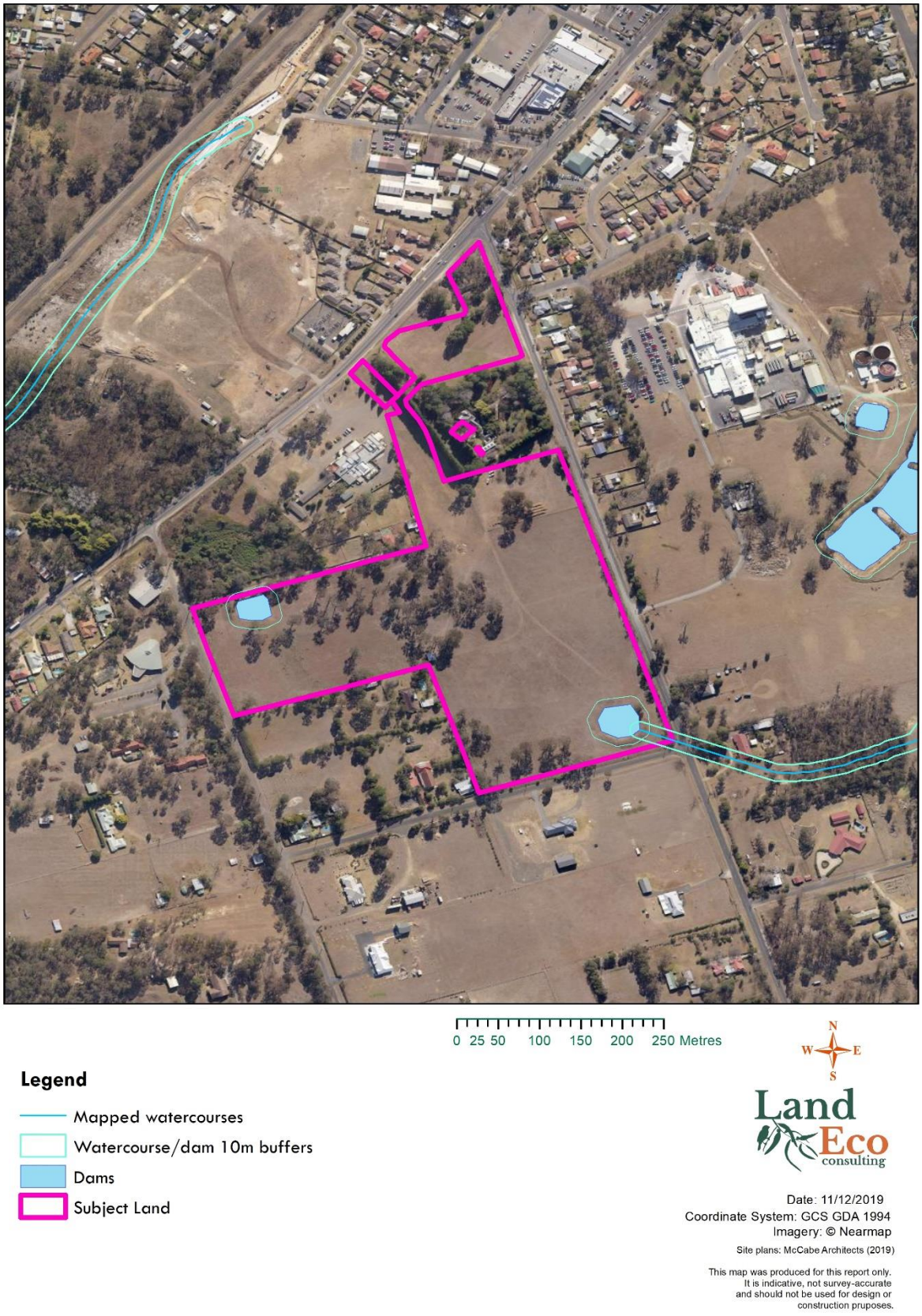

Figure 5. Watercourses (streams and waterbodies) within the vicinity of the Subject Land.

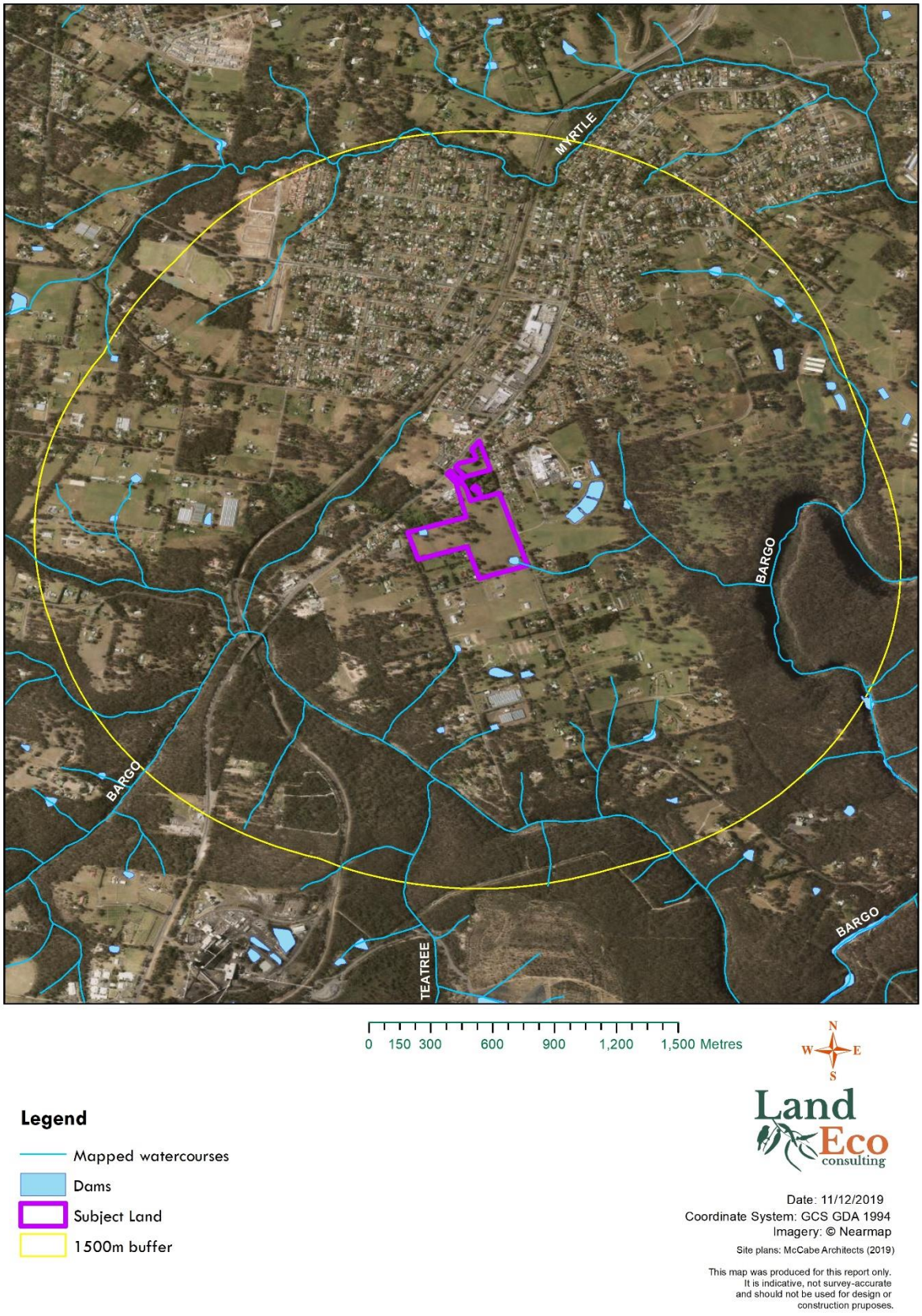

Figure 6. Watercourses that occur within the assessment area surrounding the Subject Land.

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1.10 Biodiversity Value Mapping

At the time of preparing this report, the Subject Land contained no land mapped as 'Biodiversity Value' (**Figure 7**).

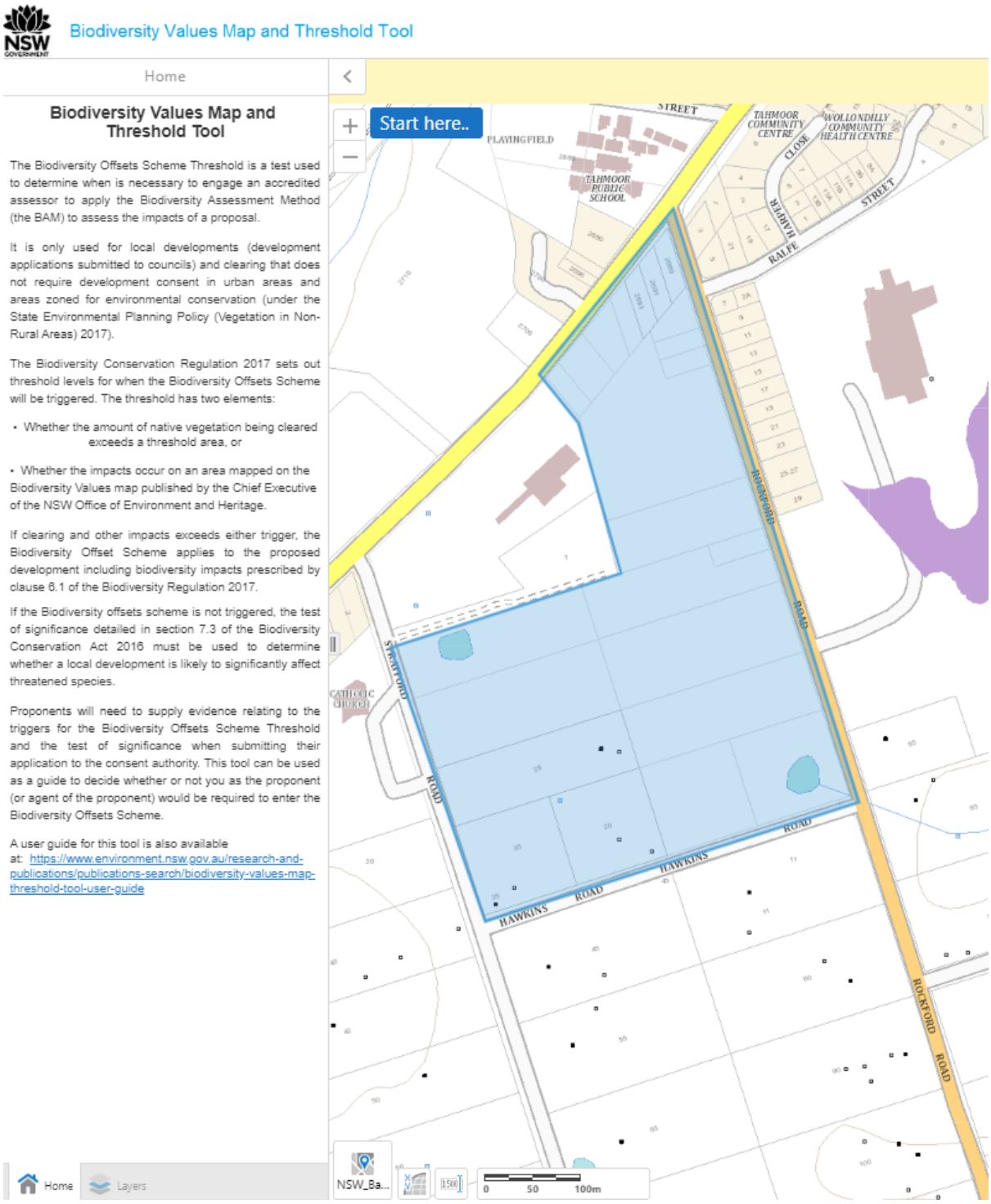

Figure 7. Biodiversity Values Map and Threshold Tool (DPIE 2019)

2. Native Vegetation

2.1 Assessing Native Vegetation Cover

Native vegetation cover and patch size have been assessed in accordance with Section 4.3 of the Biodiversity Assessment Methodology (OEH 2017a). Components of the site context will be used in order to assess the suitability of habitat for threatened species within the Subject Land.

A 1500m 'assessment circle' surrounding the outside edge of the boundary of the Subject Land was prepared in order to determine the extent of native vegetation within the surrounding locality of the Subject Land. Native vegetation was considered to cover approximately 831ha of the total 989ha area within the assessment circle, this corresponds with the >70% class (**Figure 8**).

2.2 Connectivity

Significant biodiversity links are those that connect different areas of habitat, facilitating movement of threatened species across their distribution. The presence of significant biodiversity links on a site contributes to the biodiversity value of that subject land at the landscape scale. Connectivity can be identified at different scales depending on the target species and can include recognised biodiversity corridors in a plan approved by OEH (e.g. priority investment areas), a local corridor identified by a local council, flyways for migratory species or a riparian buffer of a stream, wetland or estuary.

Land Eco has identified a routes of habitat connectivity and has classified them into two categories:

- Habitat connection – a local-scale habitat connection consisting of a narrow or disturbed vegetation corridor
- Significant biodiversity link – a locally significant habitat connection consisting of remnant vegetation, reserves, densely vegetation riparian corridors or wetlands.

The Subject Land contains a network of a habitat connections (**Figure 9**). Only one connection mapped as a 'Significant biodiversity link' enters the Subject Property in the far north-west. The remainder of the habitat connections are minor and associated with scattered canopy trees with little other habitat structure.

2.3 Assessing Patch Size

Patch size as defined by the BAM as an area of native vegetation that:

- occurs on the development site or biodiversity stewardship site, and
- includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).

Patch size may extend onto adjoining land that is not part of the development site (OEH 2017a).

Patch size was calculated according to the above guidelines. Land Eco confirmed the Subject Land must be assessed under the >100ha patch size category (**Figure 9**).

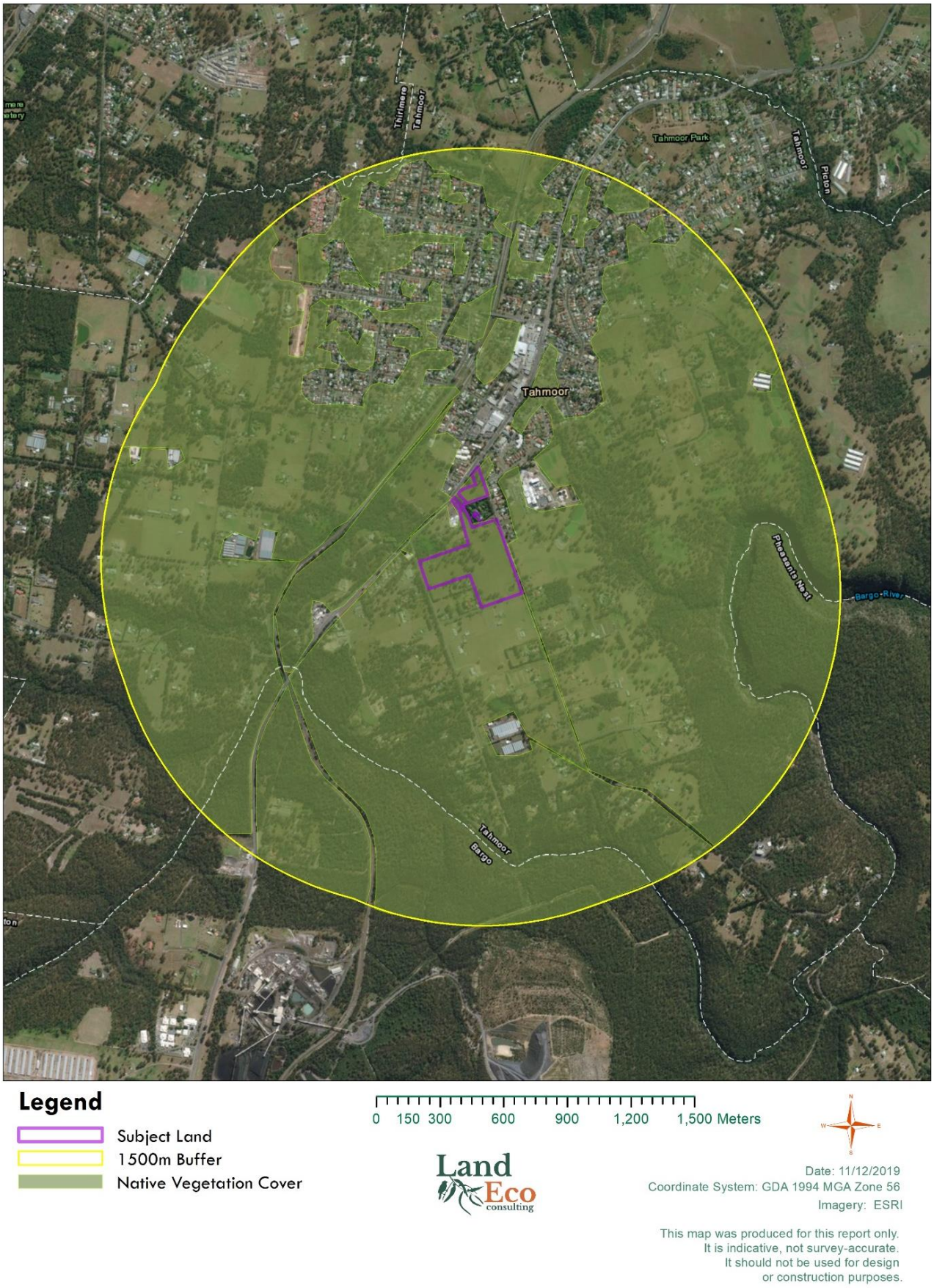

Figure 8. Native vegetation within the area surrounding the Subject Land (1500m buffer).

Figure 9. Terrestrial habitat connectivity links within the Subject Land and surrounding area.

2.4 Historically Mapped Vegetation Communities

The broad assessment of vegetation communities across NSW, undertaken by OEH (2013), mapped the Subject Land as Plant Community Type (PCT) '1081: Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion' (**Figure 10**).

Three other PCT are mapped as occurring close to the Subject Land, they are:

- 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion.
- 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion.
- 1181: Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion.

This historical mapping is coarse and most of the polygons have not been ground-truthed by vegetation Ecologists.

2.5 Plant Community Types confirmed in Subject Land

Field survey conducted by Land Eco confirmed one distinct PCT within the Subject Land (**Figure 11**) *1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion.*

2.5.1 Selection Process for PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion

The selection criteria listed within **Table 4** were selected to develop the PCT shortlist. PCT selection was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2019c). Entering the criteria into the BioNet Vegetation Classification System tool revealed a shortlist of candidate PCT.

Table 4. Selection criteria

Selection Criteria	Search Tool
IBRA Bioregion	Sydney Basin
IBRA Subregion	Cumberland
Vegetation Formation	
Reference	Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0
Dominant Upper Stratum Species	*Eucalyptus crebra* *Eucalyptus fibrosa* *Eucalyptus globoidea*

This selection process delivered four candidate PCT:

1. 860 Grey Gum - Broad-leaved Ironbark dry open forest on gorge slopes of the Blue Mountains, Sydney Basin Bioregion
2. 862 Grey Gum - Hard-leaved Scribbly Gum woodland of the Coxs River Valley, Sydney Basin Bioregion
3. 1319 White Stringybark - Grey Gum grassy forest on shale caps of the Woronora Plateau, Sydney Basin Bioregion
4. 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion

The steps taken to justify the presence or absence of each PCT within the Subject Land is provided in **Table 5.**

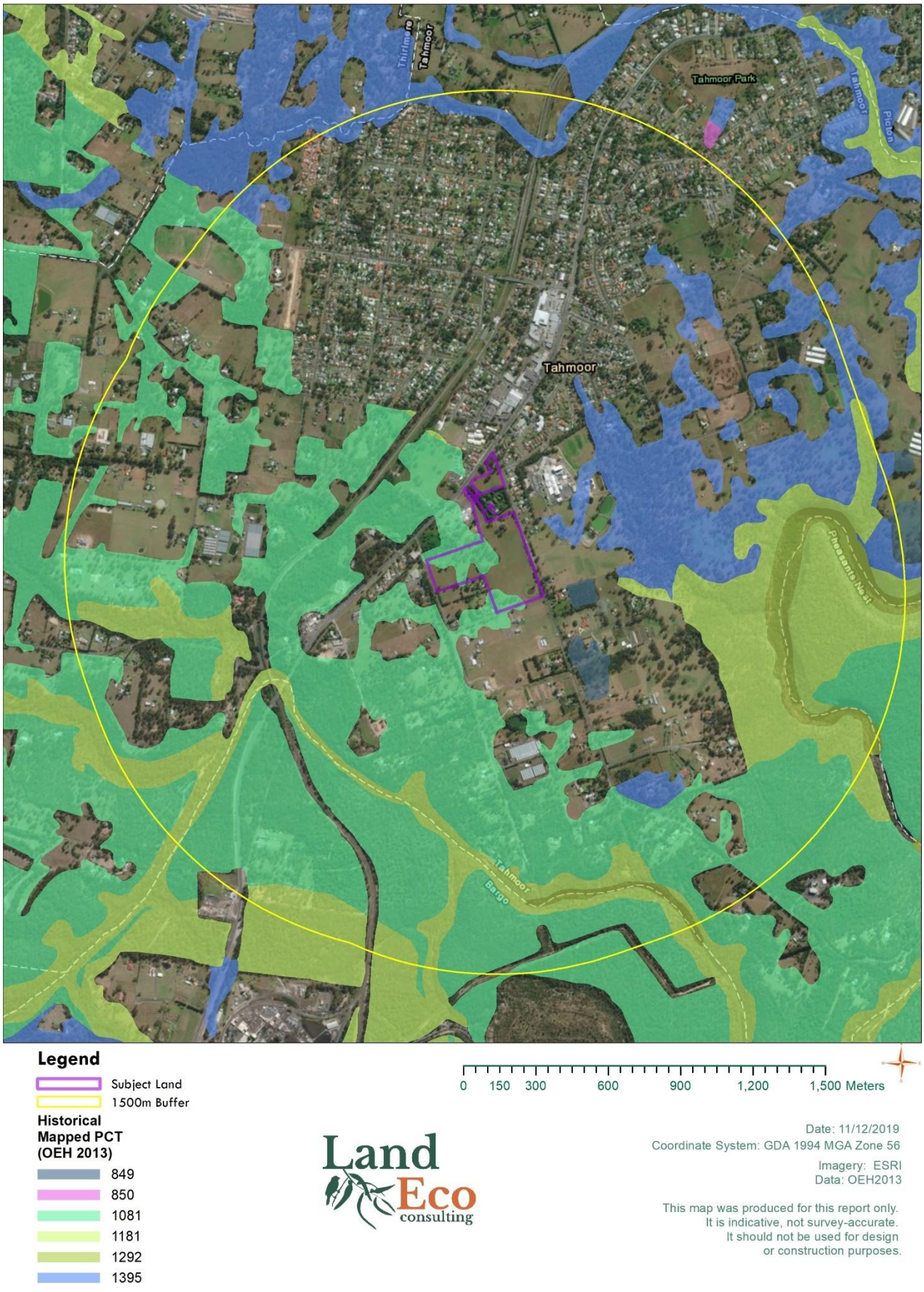

Figure 10. Historically Mapped Vegetation occurring within the Subject Land.

Table 5. Justification for choosing PCT 1395

Candidate PCT	Characteristic Canopy (Tozer et al. 2010)	Characteristic Shrub / Groundcover (Tozer et al. 2010)	Landscape Position/ Geology (Tozer et al. 2010)	Justification
860 Grey Gum - Broad-leaved Ironbark dry open forest on gorge slopes of the Blue Mountains, Sydney Basin Bioregion	Eucalypt forest or woodland dominated by *Eucalyptus punctata, Eucalyptus fibrosa, Eucalyptus eugenioides, Eucalyptus crebra.*	Sparse sclerophyll shrub layer and patchy groundcover of forbs, sedges and grasses. Characteristic species are: *Billardiera scandens,Hardenbergia violacea,Lissanthe strigosa,Notelaea longifolia,Persoonia linearis,Aristida vagans,Cheilanthes sieberi subsp. sieberi,Dianella revoluta var. revoluta,Entolasia stricta,Glycine clandestina,Goodenia hederacea,Lepidosperma laterale,Phyllanthus hirtellus,Pomax umbellata,Pratia purpurascens,Lomandra multiflora.*	Dry hill slopes in the Burragorang Valley on sandy loams and loams and typically occupies more moderate topography with greater exposure to solar radiation than Burragorang Escarpment Forest (DSF p88). Distributed from 100 – 650m ASL and occurs in areas receiving 800 – 1000mm of annual rainfall.	**Not present on the Subject Land** Two out of the four characteristic canopy species occurs as dominant species on the Subject Land, *Eucalyptus fibrosa* and *Eucalyptus crebra*. These two trees are also dominant in PCT1395. This community typically occurs on gorge slopes, in contrast, the Subject Land is a ridge top (shale cap) with gradual incline.
862 Grey Gum - Hard-leaved Scribbly Gum woodland of the Coxs River Valley, Sydney Basin Bioregion	Eucalypt woodland dominated by *Eucalyptus punctata, Eucalyptus sclerophylla, Angophora bakeri, Eucalyptus eugenioides, Eucalyptus crebra.*	Open layer of sclerophyll shrubs and a grassy groundcover *Banksia spinulosa; Leptospermum trinervium;Persoonia linearis;Phyllanthus hirtellus;Pimelea linifolia;* *Cheilanthes sieberi subsp. sieberi;Cyathochaeta diandra;Dianella revoluta var. revoluta;Entolasia stricta;Eragrostis brownii;Gonocarpus tetragynus;Goodenia hederacea;Laxmannia gracilis;Patersonia sericea;Pomax umbellata;Themeda australis;Lomandra multiflora.*	This woodland has a restricted distribution and occurs primarily in the Kedumba and Megalong valleys, up to 700m ASL, on sandy loams and loams derived from Permian sedimentary rocks. These areas receive 800 – 1250mm mean annual rainfall. It may be more widely distributed than mapped, particularly where shale/sandstone inter-bedding is common in the surface strata, but is unlikely to cover large areas. For example, small outlying occurrences have been recorded sporadically in the upper Nepean catchment and in the vicinity of Riverstone, Ebenezer and East Kurrajong on soils derived from Triassic sediments.	**Not present on the Subject Land** Only one of the five characteristic canopy species occur on the Subject Land. This PCT is typically dominated by *Eucalyptus sclerophylla* and has a diverse shrub and ground layer. The Subject Land had low native species diversity in the shrub and ground layer. The PCT occurs on Permian-type geologies. In contrast, the Subject Land is Triassic-aged sediments (Winamatta Shale and Hawkesbury Sandstone).

Candidate PCT	Characteristic Canopy (Tozer et al. 2010)	Characteristic Shrub / Groundcover (Tozer et al. 2010)	Landscape Position/ Geology (Tozer et al. 2010)	Justification
1319 White Stringybark - Grey Gum grassy forest on shale caps of the Woronora Plateau, Sydney Basin Bioregion	Open forest of *Eucalyptus globoidea, Eucalyptus punctata, Eucalyptus piperita, Eucalyptus crebra;*	Grassy open forest with an open shrub layer and a grassy groundcover. Characteristic species are *Billardiera scandens;Clematis aristata;Leucopogon lanceolatus;Persoonia linearis; Dianella caerulea;Glycin clandestina;Gonocarpus teucrioides;Lomandra longifolia;Poranthera microphylla;Pratia purpurascens;Pteridium esculentum;Viola hederacea.*	Occurs on shale lenses on elevated plateaux of the upper Nepean catchment (Woronora Plateau) between 300 and 600m altitude.	**Not present on the Subject Land** Only two of the four characteristic canopy species from this PCT occur on the Subject Land. The shrub and ground layer species are more reflective of a wet-sclerophyll/mesic forest/woodland than the dry/xeric species that dominated the Subject Land.
1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	It is a moderately tall grassy woodland / eucalypt forest with a mixed understorey of sclerophyll shrubs and grasses. Sites invariably have one of two species of ironbark (Eucalyptus crebra or Eucalyptus fibrosa) present in the canopy.	*Persoonia linearis;Bursaria spinosa subsp. spinosa;Ozothamnus diosmifolius;Hibbertia aspera; Lepidosperma laterale;Cheilanthes sieberi subsp. sieberi;Aristida vagans;Pratia purpurascens;Microlaena stipoides var. stipoides;Entolasia stricta;Lomandra multiflora;Themeda australis;Panicum simile;Echinopogon caespitosus;Pomax umbellata;Dichondra repens;Billardiera scandens;Opercularia diphylla.*	It occurs on clay soils derived from Wianamatta shale (Bannerman and Hazelton 1990) predominantly on the margins of the Cumberland Plain, Sydney, where the underlying sandstone strata are near the surface. Minor occurrences are found on isolated shale remnants in the lower Blue Mountains and the Hornsby and Woronora plateaux and, more rarely, associated with shale lenses within sandstone strata. Cumberland Shale Sandstone Transition Forest is found up to 350m ASL in areas where mean annual rainfall ranges from 800 to 1100mm	**Present on the Subject Land** The vegetation on the Subject Land is a grassy woodland with a sparse shrub layer. Two of the four characteristic dominant canopy species occur in the Subject Land (Euclayptus crebra and Eucalyptus fibrosa). Another species (*Eucalyptus punctata*) occurs in adjoining lots. The shrub layer on the Subject Land is dominated by Bursaria spinosa subsp. Spinosa. This species is not a listed characteristic species in the other candidate PCT.

2.5.2 Descriptions of the Plant Community Types located within the Subject Land

Field survey conducted by Land Eco confirmed that each of the PCT identified within the Subject Land consisted of three distinct condition classes. The vegetation, and its condition at the time of survey, within the Subject Land is detailed in **Table 6** and **Table 7** .

Table 6. Floristic summary of the three condition classes of PCT 1395 within the Subject Land.

PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion				
PCT Stats				
Area Extant (ha): 9,600 Estimated % remaining: 20-40% Area in conservation reserves (ha): 240 Estimated % of pre-clearing area in conservation reserves: <2% No. Taxa (total / unique): 406 / 2 No. Taxa per Plot (+sd): 46 (9.4) Keith Class: Coastal Valley Grassy Woodlands				
Description in VIS				
Cumberland Shale-Sandstone Ironbark Forest is found on the fringes of the Cumberland Plain. It is one of a suite of forests that are associated with the subtle intergrade between clay-rich shale soil and the coarse sandy substrates of the sandstone plateau. Within the study area, the forest is restricted to the hinterland where mean annual rainfall is relatively low (800-1000 millimetres) and soils have a distinct clay component. It is most extensively distributed on the western edge of the Woronora Plateau and above the Nepean and Georges rivers between Appin and the Holsworthy defence area. It is a moderately tall eucalypt forest with a mixed understorey of sclerophyll shrubs and grasses (Tozer et al. 2010). Sites invariably have one of two species of ironbark (*Eucalyptus crebra* or *Eucalyptus fibrosa*) present in the canopy along with grey gum (*Eucalyptus punctata*) and red bloodwood (*Corymbia gummifera*). Spotted gum (*Corymbia maculata*) and blackbutt (*Eucalyptus pilularis*) are included amongst the canopy in the Appin and Wedderburn area respectively. A sparse cover of tall casuarinas (*Allocasuarina littoralis/Allocasuarina torulosa*) is common. The understorey supports a mix of shrubs that are common on shale substrates such as blackthorn (Bursaria spinosa) and those more commonly associated with sandstone soils such as geebungs (*Persoonia spp.*). Beneath this diverse mix of shrubs is a high cover of grass and forbs. The grass layer includes a wide range of species, most of which occur more extensively on the Cumberland Plain.				
Description of the Vegetation on Subject Land				
Three distinct condition classes of PCT1395 were identified. Where a canopy layer was present it was always dominated by *Eucalyptus fibrosa* and *Eucalyptus crebra* with scattered *Eucalyptus globoidea.* The shrub-layer/midstrata was sparse or absent. Where a shrub layer was present, *Bursaria spinosa subsp. spinosa* was co-dominant with *Acacia decurrens. Acacia parramattensis* and *Melaleuca thymifolia* occurred in low densities across plots sampled. *Acacia implexa* only occurred in Condition Class 1. Groundcover on the Subject Land was typically dominated by native grasses, especially *Themeda triandra,* with *Aristida vagans, Lomandra multiflora* and, other, less common grass, sedge and herb species. A suite of exotic species, including HTE weeds were identified across all such as *Rubus fruiticosa, Olea europeaea subsp. cuspidata, Ligustrum sinense, Ligustrum lucidum, Senna pendula, Senecio madagascariensis* and *Tradescantia fluminensis.*				
Condition Classes	**Condition 1: Remnant Forest Weed Infested** (Plate 1)	**Condition 2: Canopy Remnant Under scrubbed** (Plate 2)	**Condition 3: Derived Native Grassland** (Plate 3)	**Condition 4: Exotic Dominant Grassland and Gardens** (Plate 4;Plate 5)
Approximate Extent (ha) within Subject Land	0.5	3.8	6.5	0.5
Vegetation Integrity Score	65	51.5	13.9	0.5
Description of Condition Class on Subject Land	This condition class was confined to the north of the Subject Land. It was comprised of a structurally complete vegetation assemblage, including native canopy, mid-strata and ground cover species. The mid-strata and ground-layer were heavily infested	This condition class consists of a regenerating vegetation assemblage that had been historically under scrubbed and modified. The condition class was characterised by large canopy trees over a grassy- ground layer with scattered regenerating native shrubs.	This condition class consisted of grassland that had been historically derived from clearing of woodland and shrubbery. The grassland was mostly dominated by native grasses, in particular *Themeda triandra* and *Aristida vagans.* Scattered regenerating shrubs occurred. Most commonly, *Bursaria spinosa, Acacia*	This condition class consisted of two forms: a. Exotic grassland b. Exotic gardens Both forms were dominated by exotic flora species, with few (if any) common native ground cover species scattered amongst invasive exotics.

PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion				
	with weeds. The condition class had a more structurally and floristically complete midstorey and ground layer than the other condition classes on the Subject Land. This condition class had the highest flora species richness and VIS of all the condition classes. Coarse woody debris and leaf litter was highest in this condition class. This condition class had the highest weed and High Threat Exotic species richness and cover of all of the condition classes.	This condition class had a diverse suite of native flora, with small numbers of species present from each vegetative stratum. characteristic of PCT 1395. This zone has been historically cleared/ disturbed, however native regeneration was evident. Invasive grasses and herbaceous weeds are present in moderate density and abundance throughout this zone.	*decurrens* and *Melaleuca thymifolia*.	
Structure of Vegetation in Subject Land	Native canopy vegetation was 68.5%. This was above average of 39.3%. Mature trees >50cm dbh were locally abundant. The native shrub layer cover was low at 4.2% (below average of 7.9%). Native groundcover was 36.3% which is below but close to the average of 40.2% Leaf litter was dense with an average cover of 50%.	Native canopy vegetation was 33% to 50%. This was above average of 39.3%. Mature trees >50cm dbh were locally abundant. Hollows were present in some of the trees. The native shrub layer cover was low at 3% (below average of 7.9%). Native groundcover was 36.3% - 41.6% which is close to the average of 40.2%. Leaf litter was moderately dense with an average cover of 20.4% - 21%.	Native canopy and shrub vegetation were absent. The shrub layer cover was low at at 0% to 0.6% (below average of 7.9%). Native groundcover was 54.7% - 89.4% which is above the average of 40.2%. Leaf litter was moderately sparse with an average cover of 6.8% - 8.2%.	Native canopy and shrub vegetation were absent. Ground layer contained 2.3% native groundcover comprising of four common species, *Dichondra repens, Microlaena stipoides, Oplismenus aemulus and Cyperus gracilis*. The remainder of the ground was exotic dominated by *Vulpia spp., Stenotophorum secundatum and Cenchurus clandestinus*.
Survey Effort	One BAM VIS Plot	Two BAM VIS Plots	Three BAM VIS Plots	Two BAM VIS Plots
Scientific Reference from VIS (OEH 2019)	Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., 2010 Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0;			
TEC Status (Biodiversity Conservation Act 2016)	The extent of this PCT on the Subject Land is considered to form part of the Endangered Ecological Community 'Shale Sandstone Transition Forest in the Sydney Basin Bioregion'			

Plate 1. Representative photo of PCT 1395 – Condition 1 (Remnant - weed infested) within the Subject Land.

Plate 2. Representative photo of PCT 1395 – Condition 2 (Canopy Remnant - underscrubbed) within the Subject Land.

Plate 3. Representative photo of PCT 1395 – Condition 3 (Derived Native Grassland) within the Subject Land.

Plate 4. Representative photo of PCT 1395 – Condition 4 (Exotic Dominant - gardens) within the Subject Land.

Plate 5. Representative photo of PCT 1395 - Condition 4 (Exotic dominant – exotic grassland) within the Subject Land.

Figure 11. Field validated vegetation mapping within the Subject Land and BAM VIS Plots sampled within.

2.5.3 Threatened Ecological Communities

Only one Threatened Ecological Community was confirmed to occur within the Subject Land.

All of PCT1395 corresponds to '*Shale Sandstone Transition Forest in the Sydney Basin Bioregion*' which is listed as a Critically Endangered Ecological Community (CEEC) under Schedule 1 of the BC Act in accordance with the Final Determination (NSW Threatened Species Scientific Committee 2014):

Shale Sandstone Transition Forest is the name given to the plant community characterised by the species assemblage listed in paragraph 4 of the final determination on areas that are transitional between the clay soils derived from Wianamatta Shale and the sandy soils derived from Hawkesbury Sandstone on the margins of the Cumberland Plain. All sites are within the Sydney Basin Bioregion (NSW Threatened Species Scientific Committee 2014).

2.5.4 Vegetation Integrity Survey Plots

A total of eight BAM Vegetation Integrity Survey (VIS) Plots were sampled within the Subject Land (**Figure 11**). Plot data gathered for each attribute used to assess the function of the Subject Land vegetation is detailed in **Appendix C.**

Vegetation Integrity Survey Scores, represented by existing vegetation within each vegetation zone, are detailed in **Table 7.** The future VIS Scores post development have been assigned to zero. This equates to total clearing.

In accordance with section 3.1.1.3 of the BAM (OEH 2017a) If, during the assessment of biodiversity values for any type of development, clearing or biodiversity certification proposal as required by Chapter 5 of the BAM, the assessor determines that:

(a) an area of land does not contain native vegetation, or

(b) a vegetation zone has a vegetation integrity score <15 where the PCT is representative of an endangered or critically endangered ecological community, or

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

(d) a vegetation zone has a vegetation integrity score <20 where the PCT is not representative of a TEC or associated with threatened species habitat then for that vegetation zone:

(e) assessment of native vegetation is not required beyond Section 5.4, and

(f) an assessment of threatened species habitat according to Section 6.2 and Paragraph 6.2.1.4 of the BAM is not required.

Table 7. Vegetation Integrity Survey scores for each vegetation zone.

Plant Community Type	Vegetation Zone	Area (ha)	Survey Effort	Composition Condition Score	Structure Condition Score	Function Condition Score	Vegetation Integrity Score	Future Vegetation Integrity Score	Hollow Bearing Trees
PCT 13951395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Condition 1: Remnant (Weedy)	0.53	One (1) BAM VIS Plot • Plot No. 7	50.5	66.5	81.7	65	0	0
	Condition 2: Canopy Remnant (Under scrubbed)	3.84	Two (2) BAM VIS Plot • Plot No. 1 • Plot No. 2	35.9	61.7	61.6	51.5	0	1
	Condition 3: Derived Native Grassland	6.48	Three (3) BAM VIS Plot • Plot No.5 • Plot No. 4 • Plot No.3	13.8	42.2	4.7	13.9	0	0
	Condition 4: Exotic dominant	0.53	Two (2) BAM VIS Plot • Plot No.6 • Plot No. 8	0.7	0	14.8	0.5	0	0

3. Threatened Species

3.1 Habitat Features for Species and Ecosystem Credit Fauna Species

The Land Eco Consulting Ecologists compiled a detailed summary of potential habitat for threatened fauna species, including both Species Credit and Ecosystem Credit threatened fauna species (**Table 8**).

Table 8. Fauna Habitat Values on the Subject Land

Habitat component	Site values
Coarse woody debris	Some logs, debris piles and other waste material present, but these offer relatively low value sheltering habitat. Overall coarse woody debris was sparse, and lower than what would be typically expected for PCT1395.
Rock outcrops and bush rock	Absent.
Caves, crevices and overhangs	Absent.
Culverts, bridges, mine shafts, or abandoned structures	Absent.
Nectar/lerp-bearing Trees	Scattered canopy trees, particularly *Eucalyptus fibrosa and Eucalyptus crebra* with scattered *Eucalyptus globoidea and Eucalyptus punctata* provide intermittent nectar and/or lerp sources for nomadic nectivores, such as Grey-headed Flying-fox, Regent Honeyeater, Swift Parrot and Little Lorikeet. These trees may also attract non-threatened fauna which form prey for threatened predatory fauna, such as Powerful Owl, Barking Owl, Masked Owl, Sooty Owl, Little Eagle, Square-tailed Kite, and White-bellied Sea-eagle.
Nectar-bearing shrubs	Scattered *Callistemon rigidus* and exotic flowering/fruiting trees provide foraging habitat provide intermittent nectar and/or lerp sources for nomadic nectivores, such as Grey-headed Flying-fox, Regent Honeyeater, Swift Parrot and Little Lorikeet.
Koala and Greater Glider browse	All of the *Eucalyptus spp.* may provide browse for Koala and/or Greater Glider. However, the preferred feed tree, *Eucalyptus punctata* is rare on the Subject Land.
Large stick nests	No large stick nests suitable for threatened raptorial birds of prey were observed on the Subject Land during the assessment by Land Eco. This does not rule-out the potential for raptorial birds of prey to use the tall trees on the Subject Land for future nest sites.
Sap and gum sources	No evidence of glider sap incisions was recorded. The understorey contains regrowth wattles which could provide gum for glider species and are also an insect attractant for birds and bats. However, their low number and small size means foraging value is low.
She-oak fruit (Glossy Black Cockatoo feed)	*Casuarina spp.* and *Allocasuarina spp* were absent
Seed-bearing trees and shrubs	Fruit-bearing trees such as *Eucalyptus spp.* and fruit-bearing shrubs *such as Acacia spp.* may provide foraging habitat for Gang-gang Cockatoo.
Soft-fruit-bearing trees	Generally absent other than for scattered exotic and ornamental trees which may provide fruit that could be consumed by Grey-headed Flying-fox.
Dense shrubbery and leaf litter	No areas of dense native shrubbery were present. Leaf litter was localised, not widespread.
Tree hollows and	Several scattered, small tree hollows and one large tree hollow (>8cm diameter) were observed on the Subject Land.
Decorticating bark	Bark peeling from dead Red Bloodwood tree provides very limited roosting opportunities for some microbat species and reptiles. Rough-barked trees may provide foraging and nesting habitat for Varied Sittella, Dusky Woodswallow.
Wetlands, soaks and streams	The only noticeable wet areas on the Subject Land were two small farm dams. These dams were mostly dry and devoid of aquatic of fringing vegetation, other than scattered terrestrial shrubs such as *Bursaria spinosa*.
Open water bodies	Absent.
Estuarine, beach, mudflats, and rocky foreshores	Absent.

3.2 **Candidate Ecosystem Credit Species**

Ecosystem credit species associated with the Subject Land are listed below in **Table 9.** Only two species predicted by the BAM calculator as potential Ecosystem credits were excluded from assessment. Ecosystem Credits were only calculated for vegetation zone condition class 1 and condition class 2. Vegetation zone condition class 3 and condition class 4 were excluded from assessment owing to their low VIS scores (<15) (see **Table 7**).

Table 9. Candidate Ecosystem credits predicted to occur within the Subject Land.

Scientific Name	BC Act Status	Excluded from Assessment	Reason for Exclusion from Assessment
Anthochaera phrygia Regent Honeyeater (Foraging)	Critically Endangered	No	-
Artamus cyanopterus cyanopterus *Dusky Woodswallow*	Vulnerable	No	-
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	Vulnerable	No	-
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	Vulnerable	No	-
Chthonicola sagittate Speckled Warbler	Vulnerable	No	-
Climacteris picumnus Brown Treecreeper	Vulnerable	No	-
Daphoenositta chrysoptera Varied Sittella	Vulnerable	No	-
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	No	-
Falsistrellus tasmaniensis Eastern False Pipistrelle	Vulnerable	No	-
Grantiella picta Painted Honeyeater	Vulnerable	No	-
Glossopsitta pusilla Little Lorikeet	Vulnerable	No	-
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	Vulnerable	No	-
Hieraaetus morphnoides Little Eagle (Foraging)	Vulnerable	No	-
Lathamus discolour Swift Parrot (Foraging)	Endangered	No	-
Lophoictinia isura Square-tailed Kite (Foraging)	Vulnerable	No	-
Melithreptus gularis gularis Black-chinned Honeyeater	Vulnerable	No	-
Melanodryas cucullata cucullata Hooded Robin	Vulnerable	No	-
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	Vulnerable	No	-
Miniopterus australis Little Bent-winged bat (Foraging)	Vulnerable	No	-
Miniopterus orianae oceanensis Large Bent-winged bat (Foraging)	Vulnerable	No	-
Mormopterus norfolkensis Eastern Freetail-bat	Vulnerable	No	-
Neophema pulchella Turquoise Parrot	Vulnerable	No	-

Scientific Name	BC Act Status	Excluded from Assessment	Reason for Exclusion from Assessment
Ninox connivens Barking Owl (Foraging)	Vulnerable	No	-
Ninox strenua Powerful Owl (Foraging)	Vulnerable	No	-
Petaurus australis Yellow-bellied Glider	Vulnerable	Yes	-
Petroica boodang Scarlet Robin	Vulnerable	No	-
Petroica phoenicea Flame Robin	Vulnerable	No	-
Phascolarctos cinereus Koala (Foraging)	Vulnerable	No	-
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	Vulnerable	No	-
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	Vulnerable	No	-
Stagnopleura guttata Diamond Firetail	Vulnerable	No	-
Scoteanax rueppellii Greater Broad-nosed Bat	Vulnerable	No	-
Tyto novaehollandiae Masked Owl (Foraging)	Vulnerable	No	-
Tyto tenebricosa Masked Owl (Foraging)	Vulnerable	No	-
Varanus rosenbergi Rosenberg's Goanna	Vulnerable	No	-

3.3 Candidate Species Credit Species

This section provides a summary of the candidate Species Credit fauna (**Table 10**) and flora species (**Table 11**) for the Subject Land derived from BAMC (OEH 2017b) and a 10km BioNet Atlas Search (DPIE 2019c). A summary of the targeted survey effort applied to each species is provided along with the results of the survey effort, specifically whether or not the Species Credit needs to be offset through retiring of Biodiversity Offset Credits (**Table 10; Table 11**). As per Section 6.4.1.30 of the BAM, where a species is assumed to be present on the Subject Land, the species polygon must encompass the entire vegetation zone/s within which the candidate species is predicted to use/occur. Condition classes 3 and 4 of PCT 1395 both had VIS scores < 15 therefore, the habitat is considered sufficiently degraded across these zones as to not require offsetting for any Species Credits (BAM 2017a). Condition classes 1 and 2 of PCT 1395 both scored VIS >15 and therefore required further assessment for use by threatened species, most notably Species Credit Species (**Table 10**).

Table 10. Candidate Fauna Species Credits predicted to occur within the Subject Land.

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Suitable Habitat Present within/around the Subject Land?	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Anthochaera phrygia Regent Honeyeater (Breeding)	Critically Endangered	No	Yes. Multiple bird census from May 2019 to January 2020.	There is no suitable nesting habitat, only foraging habitat. The Subject Land is not included on the map of important areas for Regent Honeyeater.	Moderate. Suitable nesting and foraging habitat occur.	Very High - 3	No
Burhinus grallarius Bush Stone-curlew	Endangered	Yes	Yes. Four nights of spotlighting and call playback from 17th – 21st January 2020.	Suitable nesting and foraging habitat.	Moderate. This species may occur on the Subject Land.	High - 2	No
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Vulnerable	Yes	Yes. Multiple bird census from May 2019 to January 2020.	This species requires large trees with hollows >9cm for breeding. There are some suitable hollows. A targeted survey was undertaken at the appropriate time of year. This species was not found.	Moderate. This species may breed on the Subject Land	High - 2	No
Callocephalon fimbriatum - endangered population Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	Endangered Population	No	NA	No. This population only occurs in Hornsby and Ku-ring-gai	NA	NA	NA
Calyptorhynchus lathami Glossy Black- Cockatoo (Breeding)	Vulnerable	Yes	Yes. Multiple bird census from May 2019 to January 2020.	This species requires living or dead trees with hollows greater than 15cm diameter and greater than 5m above ground for breeding. Such habitat does not occur on the Subject Land. A targeted survey was undertaken at the appropriate time of year. This species was not found.	Unlikely. No suitable nesting habitat.	High - 2	No
Cercartetus nanus Eastern Pygmy-Possum	Vulnerable	No	Yes. Installation of four honey-baited infra-red cameras on trees.	This species prefers woodlands and heath, and feeds on invertebrates as well as on nectar and pollen from *Banksia spp., Corymbia spp., Eucalyptus spp.* and *Callistemon spp.* The habitat on the Subject Land is degraded and there is no understorey suitable for Eastern Pygmy Possum. There are no suitable small hollows or possum dreys suitable for Eastern Pygmy Possum on the Subject Land.	Unlikely. No suitable foraging or nesting habitat.	NA	NA

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Suitable Habitat Present within/around the Subject Land?	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Chalinolobus dwyeri Large-eared Pied Bat	Vulnerable	No	Yes. Two AnaBat Express devices installed over eight nights between December and January 2020.	The Subject Land is assumed to support Large-eared Pied Bat, because the Subject Land occurs within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices. This is the BAM trigger to include Large-eared Pied Bat in an assessment (OEH 2018d). After carrying out a field assessment of the habitat constraints or microhabitats on the Subject Land, it was determined that this habitat may occur within 2km of the Subject Land. There is no suitable cavernous breeding habitat in the Subject Land, only foraging habitat (native tree canopy and open areas). In the absence of appropriately timed targeted survey or expert report, this species is assumed present.	Moderate Potential. All habitat (including all native vegetation that may be foraged in/around) on the Subject Land where the Subject Land is within 2km of caves, scarps, cliffs, rock overhangs and disused mines (OEH 2018d). See Appendix E for Species Polygon.	Very High - 3	Yes
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Vulnerable	Yes	Yes. Multiple bird census and searches for stick nests from May 2019 to January 2020.	This species builds a stick nest in tall trees. A targeted survey was conducted over the course of four days, within the correct survey period (OEH 2019a). No evidence of breeding was recorded. No large stick nests within tall, trees were observed on the Subject Land. A targeted survey was undertaken at the appropriate time of year. This species was not found. (OEH 2019a).	Unlikely. No stick nests observed during the survey period which met the relevant OEH survey timing (OEH 2019a)	High - 2	No
Heleioporus australiacus Giant Burrowing Frog	Vulnerable	Yes	Yes. Four nights of spotlighting and call playback around each dam from 17th – 21st January 2020. Surveys undertaken before and during rainfall.	This species is dependent on flowing creeks, drainage lines and hanging swamps on the top of sandstone plateaus and deeply dissected gullies. There were creeks and wet areas in the Subject Land. It is located on shale, albeit close to the sandstone boundary. There are records of this species from shale-derived soils. Its presence cannot be ruled out without appropriate survey.	Low. Low quality suitable foraging or breeding habitat.	Moderate - 1.5	No
Hieraaetus morphnoides Little Eagle (Breeding)	Vulnerable	Yes	Yes. Multiple bird census and searches for stick nests from May 2019 to January 2020.	This species builds a stick nest in tall trees. A targeted survey was conducted over the course of four days, within the correct survey period (OEH 2019a). No evidence of breeding was recorded. No large stick nests within tall, trees were observed on the Subject Land. Yes - A targeted survey was undertaken at the appropriate time of year. This species was not found.	Unlikely. No stick nests observed during the survey period which met the relevant OEH survey timing (OEH 2019a)	Moderate - 1.5	No
Lathamus discolour Swift Parrot (Breeding)	Endangered	No	Yes. Multiple bird census from May 2019 to September 2019.	The Subject Land provides foraging habitat for Swift Parrot. The species does not breed on mainland Australia.	Moderate. This species may forage on the Subject Land.	Very High - 3	No
Litoria aurea Green and Golden Bell Frog	Endangered	Yes	Four nights of spotlighting and call playback around each dam from 17th – 21st January 2020. Surveys undertaken	The Green and Golden Bell Frog requires marshes, dams and stream-sides, particularly those containing bulrushes (*Typha* spp.) or spike rushes (*Eleocharis* spp.) for breeding. No suitable breeding habitat occurs within the Subject Land. The Green and Golden Bell Frog may forage in open grassy areas, away from	Low Potential. It is possible that this frog could utilise the dams within the Subject Land and adjoining properties for breeding. It is possible that this frog may forage within	High - 2	No

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Suitable Habitat Present within/around the Subject Land?	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
			before and during rainfall. Reference population at Sydney Olympic Park confirmed calling (L.Skowronek pers. comm).	water during wet conditions but will retreat back to water during dry times. There are two waterbodies in the Subject Land and several more mapped waterbodies that occur within 1km of the Subject Land and this is the BAM trigger to include the species in the assessment.	the Subject Land during wet weather. See Appendix E for Species Polygon.		
Lophoictinia isura Square-tailed Kite (Breeding)	Vulnerable	Yes	Yes. Multiple bird census and searches for stick nests from May 2019 to January 2020.	This species builds a stick nest in tall trees. A targeted survey was conducted over the course of four days, within the correct survey period (OEH 2019a). No evidence of breeding was recorded. No large stick nests within tall, trees were observed on the Subject Land. A targeted survey was undertaken at the appropriate time of year. This species was not found.	Unlikely. No stick nests observed during the survey period which met the relevant OEH survey timing (OEH 2019a)	Moderate - 1.5	No
Meridolum corneovirens Cumberland Plain Land Snail	Vulnerable	Yes	Yes. Targeted searches under bark, woody debris, and leaf litter conducted between May 2019 and January 2020.	This species inhabits woodland in the Cumberland Plain. It mostly occurs under bark at the base of trees such as Eucalyptus spp. It may also occur under discarded anthropogenic materials. A targeted survey was undertaken at the appropriate time of year. This species was not found.	Unlikely. Targeted surveys revealed no individuals in the Subject Land.	High – 2	No
Miniopterus australis Little Bent-winged Bat (Breeding)	Vulnerable	No	Yes. Two AnaBat Express devices installed over eight nights between December and January 2020.	This species breeds in caves, tunnels, mine shafts, culverts and outcrops. None of which occur in or near the Subject Land.	Unlikely. No suitable breeding habitat (no escarpments, caves, or human structures) within 100m of the Subject Land.	NA	NA
Miniopterus orianae oceanensis Large Bent-winged Bat (Breeding)	Vulnerable	No	Yes. Two AnaBat Express devices installed over eight nights between December and January 2020.	This species breeds in caves, tunnels, mine shafts, culverts and outcrops. None of which occur in or near the Subject Land.	Unlikely. No suitable breeding habitat (no escarpments, caves, or human structures) within 100m of the Subject Land.	NA	NA
Myotis macropus Southern Myotis	Vulnerable	Yes	Yes. Two AnaBat Express devices installed over eight nights between December and January 2020.	The Subject Land is assumed to support Southern Myotis because the Subject Land occurs within 200m of a riparian zone or waterbody. This is the BAM trigger to include Southern Myotis in an assessment (OEH 2018d). In the absence of appropriately timed targeted survey or expert report, this species is assumed present through the entirety of native vegetation on the Subject Land.	High. Suitable foraging habitat (open water bodies and creek lines) occur within 200m of the Subject Land. See Appendix E for Species Polygon.	High – 2	Yes
Ninox connivens Barking Owl (Breeding)	Vulnerable	No	Yes. Four nights of spotlighting and call playback from 17th – 21st January 2020. Surveys undertaken	This species requires living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground for breeding. Such habitat does not occur on the Subject Land.	Unlikely. No suitable breeding habitat.	High – 2	No

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Suitable Habitat Present within/around the Subject Land?	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
			before and during rainfall.				
Ninox strenua Powerful Owl (Breeding)	Vulnerable	No	No	This species requires living or dead trees with hollows greater than 20 cm diameter for breeding. Such habitat does not occur on the Subject Land.	Unlikely. No suitable breeding habitat (no large hollow-bearing trees).	High - 2	No
Petaurus norfolcensis Squirrel Glider	Vulnerable	Yes	Yes. Four nights of spotlighting and call playback between 17th – 21st January 2020. Scat searches and installation of four baited tree mounted IR cameras also undertaken.	Suitable foraging habitat including the nectar and sap from *Acacia spp.* and *Eucalyptus spp.* in the Subject Land. The Subject Land adjoins bushland reserves where potential nest hollows may occur. Since the Threatened Species Profile Database (OEH 2019a) lists no Habitat Constraint for this species, any potential area of habitat (either breeding, foraging or both) triggers the assumption that this species is present within the Subject Land.	Low to Moderate Potential. Suitable foraging habitat (i.e. *Acacia spp., Eucalyptus spp.* occurs within the Subject Land. See Appendix E for Species Polygon.	High - 2	No
Phascolarctos cinereus Koala (Breeding)	Vulnerable	Yes	Yes. Four nights of spotlighting and call playback between 17th – 21st January 2020. Scat searches and installation of tree mounted IR cameras also undertaken.	Suitable foraging habitat occurs within the Subject Land (*Eucalyptus spp.*), however, there are no recent proximal records of Koala near the Subject Land or the adjoining reserves. No individual koala nor scats, tracks or traces observed during the Site Assessment.	Low. Suitable foraging habitat may breed on site. No recent proximal records. No individuals, scats, tracks or traces observed in any tree during the Site Assessment.	High - 2	No
Pommerhelix duralensis Dural Land Snail	Endangered	Yes	Yes. Targeted searches under bark, woody debris, and leaf litter conducted between May 2019 and January 2020.	This species inhabits woodland in the Cumberland Plain. It mostly occurs under bark at the base of trees such as Eucalyptus spp. It may also occur under discarded anthropogenic materials. A targeted survey was undertaken at the appropriate time of year. This species was not found.	Unlikely. This species inhabits woodland in the Cumberland Plain. It mostly occurs under bark at the base of trees such as Eucalyptus spp. It may also occur under discarded anthropogenic materials.	High – 2	No
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Vulnerable	Yes	Yes. Diurnal searches for roost camps undertaken between May 2019 and January 2020	There was no active breeding colony located on the Subject Land nor any signs of such have occurred on site previously. A targeted survey was undertaken at the appropriate time of year.	Unlikely. No roost colony on Subject Land.	High – 2	No
Pseudophryne australis Red-crowned Toadlet	Vulnerable	No	Yes. Four nights of spotlighting and call playback around each dam from 17th – 21st January 2020. Surveys undertaken	This species is only found on the margin of Cumberland Plain where sandstone outcrops intersect. Such habitat does not occur in the Subject Land.	Unlikely. This species is only found on the margin of Cumberland Plain where sandstone outcrops intersect. Such habitat does not occur in the Subject Land.	NA	NA

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted?	Suitable Habitat Present within/around the Subject Land?	Likelihood of Occurrence of Species Credit on Subject Land	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
			before and during rainfall.				
Tyto novaehollandiae Masked Owl (Breeding)	Vulnerable	No	No	This species requires caves or living or dead trees with hollows greater than 20 cm diameter for breeding. Such habitat does not occur on the Subject Land.	Unlikely. No suitable breeding habitat (no large hollow-bearing trees).	NA	NA
Tyto tenebricosa Sooty Owl (Breeding)	Vulnerable	No	No	This species requires caves or living or dead trees with hollows greater than 20 cm diameter for breeding. Such habitat does not occur on the Subject Land.	Unlikely. No suitable breeding habitat (no large hollow-bearing trees).	NA	NA

Table 11. Candidate Flora Species Credits predicted to occur within the Subject Land.

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land / Proximity of Species Records	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Acacia bynoeana Bynoe's Wattle	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations, with the size of the populations at most locations being very small (1-5 plants). It has recently been found in the Colymea and Parma Creek areas west of Nowra.	High - 2	No
Acacia pubescens *Downy Wattle*	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Found throughout the Cumberland plain on soils derived from Wianamatta Shale or gravels.	High - 2	No
Caladenia tessellata Thick Lip Spider Orchid	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Tahmoor and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border.	Moderate – 1.5	No
Callistemon linearifolius Netted Bottle Brush	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found.	Moderate – 1.5	No

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land / Proximity of Species Records	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
				Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. The species was more widespread in the past, and there are currently only 5-6 populations remaining from the 22 populations historically recorded in the Sydney area. Three of the remaining populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve and Spectacle Island Nature Reserve. The species has also been recorded from Yengo National Park		
Dillwynia tenuifolia *Dillwynia tenuifolia*	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. The core distribution is the Cumberland Plain from Windsor and Penrith east to Dean Park near Colebee. Other populations in western Sydney are recorded from Voyager Point and Kemps Creek in the Liverpool LGA, Luddenham in the Penrith LGA and South Maroota in the Baulkham Hills Shire. Disjunct localities outside the Cumberland Plain include the Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains.	High - 2	No
Dillwynia tenuifolia - endangered population *Dillwynia tenuifolia, Kemps Creek*	Endangered Population	No	No	Does not occur in Wollondilly	NA	NA
Epacris purpurascens var. purpurascens	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Found in a range of habitat types, most of which have a strong shale soil influence. Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South.	Moderate – 1.5	No
Grevillea parviflora subsp. parviflora	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Found in a range of habitat types, most of which have a strong shale soil influence. Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South.	High - 2	No
Grevillea parviflora subsp. supplicans	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Found in a range of habitat types, most of which have a strong shale soil influence. Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South.	High - 2	No
Gyrostemon thesioides	Endangered	No	No	No suitable habitat present. Grows on hillsides and riverbanks and may be restricted to fine sandy soils. Within NSW, has only ever been recorded at three sites, to the west of Sydney, near the Colo, Georges and Nepean Rivers. The most recent sighting was of a single male plant near the Colo River within Wollemi National Park. The species has not been recorded from the Nepean and Georges Rivers for 90 and 30 years respectively, despite searches.	NA	NA

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land / Proximity of Species Records	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Hibbertia puberula Hibbertia puberula	Endangered	Yes	No	Yes - A targeted survey was undertaken at the appropriate time of year. This species was not found. Recent work on this species (Toelken & Miller 2012) and its relatives have shown it to be widespread, but never common. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath (Toelken & Miller 2012).	High – 2	No
Hibbertia spanantha Julian's Hibbertia	Critically Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Grows in forest with canopy species *including Eucalyptus pilularis, E. resinifera, Corymbia gummifera and Angophora costata. The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae.* Flowering in October and November, but with an odd flower throughout the year. The soil is identified as a light clay occuring on a shale sandstone soil transition.	Very High - 3	No
Hibbertia superans	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney, Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	High – 2	No
Leucopogon fletcheri subsp. fletcheri	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Flowers August to September. Fruit produced October. Evidence suggests the species responds slowly to fire. The species is an obligate seeder and slow growing with a maturation period likely to exceed 5 years.	High – 2	No
Marsdenia viridiflora subsp. viridiflora - endangered population *Marsdenia viridiflora subsp. viridiflora - endangered population* *Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown,*	Endangered Population	No	No	Does not occur in Wollondilly	NA	NA

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land / Proximity of Species Records	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
Fairfield, Holroyd, Liverpool and Penrith local government areas						
Melaleuca deanei Deane's Paperbark	Vulnerable	Yes	Yes	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone.	High – 2	No
Persoonia bargoensis Bargo Geebung	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. The Bargo Geebung occurs in woodland or dry sclerophyll forest on sandstone and on heavier, well drained, loamy, gravelly soils of the Wianamatta Shale and Hawkesbury Sandstone. It favours interface soil landscapes such as between the Blacktown Soil Landscape and the complex Mittagong Formation soils (Lucas Heights Soil Landscape) with the underlying sandstone (Hawkesbury Soil Landscape and Gymea Soil Landscape). Some of the vegetation the species occurs within would be recognised as the Shale/Sandstone Transition Forest, a listed community.	High – 2	No
Persoonia hirsuta Hairy Geebung	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Persoonia hirsuta has a scattered distribution around Sydney. The species is distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Persoonia hirsuta has a large area of occurrence, but occurs in small populations, increasing the species' fragmentation in the landscape. The Hairy Geebung is found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Very High – 2	No
Persoonia nutans Nodding Geebung	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. The species has a disjunct distribution, with most populations (and 99% of individuals) occurring in the north of the species range in the Agnes Banks, Londonderry, Castlereagh, Berkshire Park and Windsor Downs areas. Core distribution occurs within the Penrith, and to a lesser extent Hawkesbury, local government areas, with isolated and relatively small populations also occurring in the Liverpool, Campbelltown, Bankstown and Blacktown local government areas. The southern and northern populations have distinct habitat differences. Southern populations also occupy tertiary alluvium but extend onto shale sandstone transition communities and into Cooks River / Castlereagh Ironbark Forest.	High – 2	No
Pimelea curviflora var. curviflora	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Confined to the coastal area of the Sydney and Illawarra regions. Populations are known between northern Sydney and Maroota in the north-west. Occurs on	High – 2	No

Scientific Name	NSW BC Act (2016) listing status	Included in Assessment?	Targeted Survey Conducted	Habitat Present on Subject Land / Proximity of Species Records	Biodiversity Risk Weighting	Are Biodiversity Offset Credits Required?
				shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat at Albion Park on the Illawarra coastal plain.		
Pomaderris brunnea Brown Pomaderris	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. It grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	High – 2	No
Pterostylis saxicola Sydney Plains Greenhood	Endangered	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Two populations occur within a conservation reserve (Georges River National Park; Scheyville NP). Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where Pterostylis saxicola occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	High – 2	No
Pultenaea pedunculata Matted Bush-pea	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. In the Cumberland Plain the species favours sites in clay or sandy-clay soils (Blacktown Soil Landscape) on Wianamatta Shale-derived soils, usually close to patches of Tertiary Alluvium (Liverpool area) or at or near the Shale-Sandstone interface (Appin). All sites have a lateritic influence with ironstone gravel (nodules) present.	High – 2	No
Tetratheca glandulosa Tetratheca glandulosa	Vulnerable	Yes	Yes	A targeted survey was undertaken at the appropriate time of year. This species was not found. Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops.	High – 2	No

3.4 Targeted Species Credit Surveys

Targeted threatened flora surveys were conducted by Ecologists from another consultancy 'Narla Environmental Pty Ltd' on the 14th May 2019, 23rd September 2019 and 12th November 2019 (**Table 12;Figure 12**). Further surveys were undertaken by Ecologist from Land Eco Consulting on 7th to the 8th December 2019 and from 15th January to 21st January 2019 (**Table 12**). Reference populations were visited for *Pimelea spicata* (Richardson Road, Narellan) and correspondence was held with DPIE to confirm that the targeted orchid species were in flower during the survey period.

3.4.1 Flora Species Credit Survey

A total of 21 flora Species Credit species were identified within the BAMC (OEH 2017b) as having the potential to occur within the Subject Land (**Table 12**). It was confirmed that none of these species were present on the Subject Land following targeted survey during the appropriate time of year as determined by best practice guidelines (OEH 2016b). These species were subsequently excluded from further assessment.

Table 12. Survey effort undertaken for Flora Species Credit species identified as having potential to occur within the Subject Land.

Candidate Flora Species	Survey Period (BAMC)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acacia bynoeana Bynoe's Wattle					☑				☑		☑	☑
Acacia pubescens Downy Wattle					☑				☑		☑	☑
Caladenia tessellata Thick Lip Spider Orchid									☑			
Callistemon linearifolius Netted Bottle Brush											☑	☑
Dillwynia tenuifolia									☑			
Epacris purpurascens var. purpurascens									☑			
Grevillea parviflora subsp. parviflora Small-flower Grevillea									☑		☑	
Grevillea parviflora subsp. supplicans									☑		☑	
Hibbertia puberula											☑	☑
Hibbertia spanantha Julian's Hibbertia											☑	
Hibbertia superans									☑		☑	☑
Leucopogon fletcheri subsp. fletcheri									☑			
Melaleuca deanei Deane's Paperbark					☑				☑		☑	☑
Persoonia bargoensis Bargo Geebung					☑				☑		☑	☑
Persoonia hirsuta Hairy Geebung					☑				☑		☑	☑
Persoonia nutans Nodding Geebung					☑				☑		☑	☑
Pimelea curviflora var. curviflora									☑		☑	☑
Pomaderris brunnea									☑			
Pterostylis saxicola Sydney Plains Greenhood									☑		☑	
Pultenaea pedunculata Matted Bush-pea									☑		☑	
Tetratheca glandulosa									☑		☑	
Key									= Optimum survey period			
	☑								= Survey undertaken during this month			
	AP								= No targeted survey undertaken; species assumed present on site.			

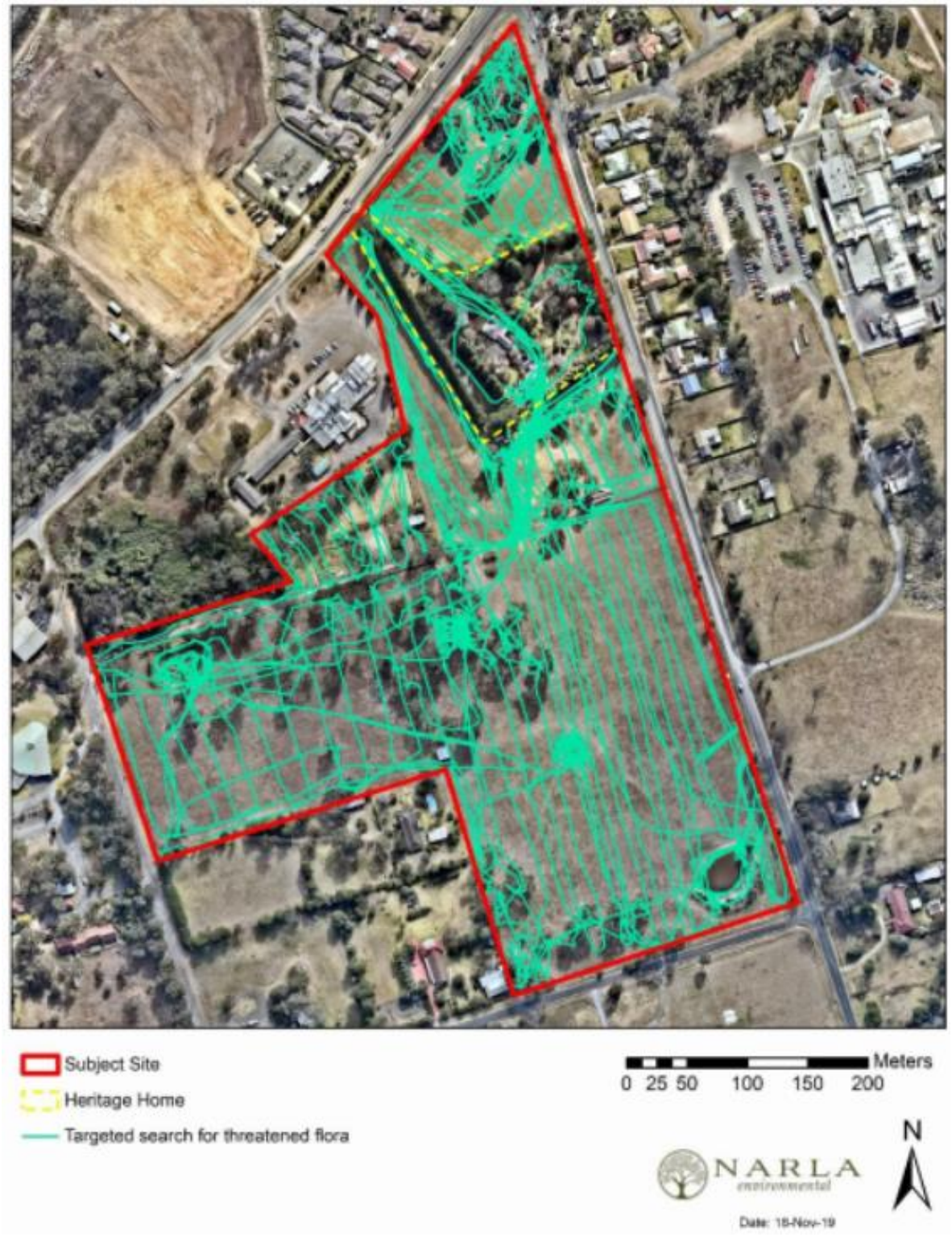

Figure 12. Targeted survey effort undertaken for Species Credit flora and fauna by Ecologists from Environmental Consultancy 'Narla Environmental'. Image provided to Land Eco Pty Ltd by Common Ground Property on 12th December 2019.

3.4.2 Fauna Species Credit Survey

A suite of 24 fauna Species Credit Species were identified within the BAMC (DPIE 2019b) as having the potential to occur within the Subject Land (**Table 10**) of these 16 were identified as requiring further assessment(**Table 13**). The other seven Species Credit Species were ruled-out of the assessment, owing to a lack of suitable habitat on the Subject Land.

As per Section 6.4.1.18 of the BAM, 'A candidate Species Credit species that is not considered to have suitable habitat on the Subject Land (or specific vegetation zones) in accordance with Paragraph 6.4.1.17 does not require further assessment on the Subject Land (or specific vegetation zones)' (OEH 2017a). Justification for determining that certain predicted Species Credit species were unlikely to have suitable habitat on the Subject Land (or specific vegetation zones) are provided (**Table 10**).

Targeted surveys were not undertaken for all candidate Species Credit species that were considered to have the potential to occur within the Subject Land. Detail on the habitat constraints/microhabitat of these species, and the targeted survey effort undertaken are presented (**Table 8;Table 10**).

The targeted survey effort confirmed the absence of all of the species listed in **Table 13,** except Large-eared Pied Bat and Southern Myotis which were confirmed present and therefore will require offset.

Table 13. Survey effort undertaken for Fauna Species Credit species identified as having potential to occur within the Subject Land.

Candidate Flora Species	Survey Period (BAMC)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anthochaera phrygia Regent Honeyeater	☑				☑							
Burhinus grallarius Bush Stone-curlew	☑											
Callocephalon fimbriatum Gang-gang Cockatoo	☑										☑	☑
Calyptorhynchus lathami Glossy Black-Cockatoo					☑							
Chalinolobus dwyeri Large-eared Pied Bat	☑										☑	
Haliaeetus leucogaster White-bellied Sea-Eagle									☑		☑	☑
Heleioporus australiacus Giant Burrowing Frog	☑											
Hieraaetus morphnoides Little Eagle									☑			
Lathamus discolor Swift Parrot					☑							
Litoria aurea Green and Golden Bell Frog	☑											
Lophoictinia isura Square-tailed Kite											☑	☑
Meridolum corneovirens Cumberland Plain Land Snail	☑				☑				☑		☑	☑
Myotis macropus Southern Myotis	☑					AP						
Petaurus norfolcensis Squirrel Glider	☑											
Phascolarctos cinereus Koala	☑					AP						
Pommerhelix duralensis Dural Land Snail	☑				☑				☑		☑	☑
Key							= Optimum survey period					
	☑						= Survey undertaken during this month					
	AP						= No targeted survey undertaken; species assumed present on site.					

3.4.3 Species Polygons

A suite of candidate Species Credit species (**Table 13**) could not be surveyed due to the optimal survey period occurring outside of the site assessments that were undertaken.

Where a Species credit species is assumed/confirmed to be present within the Subject Land, the assessor must assign species polygon that encompasses the entire vegetation zone(s)within which the candidate species is predicted to occur based on the correct application of the BAMC (OEH 2017a; DPIE 2019).

Each species polygon encompassed all PCT 1395 vegetation zone condition class 1 and condition class 2 (**Appendix E**). The reasons for assigning particular vegetation classes to species polygons are provided (**Table 14**) No species credit species were expected to use condition class 4 of PCT 1395 as it was considered to be too degraded.

Table 14. Reasoning for assignation of vegetation zones to Species Polygons

Species	Vegetation Zones Inhabited	Area (ha)	Reason for Assigning Zone to Species Polygon
Large-eared Pied Bat	Condition Class 1: PCT 1395 Weed Infested Remnant (0.5 ha)	0.5	This zone contains suitable foraging areas (flyways above trees, shrubs and groundcover) throughout.
	Condition Class 2: PCT 1395 Canopy Remnant (3.8 ha)	3.8	This zone contains suitable foraging areas (flyways above trees, shrubs and groundcover) throughout.
Southern Myotis	Condition Class 1: PCT 1395 Weed Infested Remnant	0.5	This zone is within 200m of a waterbody and contains suitable temporary roosts (loose tree bark) and foraging areas (flyways above trees, shrubs and groundcover) throughout.
	Condition Class 2: PCT 1395 Canopy Remnant	3.8	This zone is within 200m of a waterbody and contains suitable temporary roosts (loose tree bark and hollows) and foraging areas (flyways above trees, shrubs and groundcover) throughout.

4. Impact Summary

This chapter of the report details the type and extent of impacts to biodiversity that will occur as a result of the proposed development.

4.1 Serious and Irreversible Impacts

In accordance with section 7.16 of the BC Act, a proposed development or activity that has serious and irreversible impacts (SAII) on biodiversity values is defined as any serious and irreversible impacts on biodiversity values as determined under section 6.5 of the BC Act that would remain after the measures proposed to be taken to avoid or minimise the impact on biodiversity values of the proposed development or activity.

The consent authority must refuse to grant consent under Part 4 of the Environmental Planning and Assessment Act 1979 , in the case of an application for development consent to which this Division applies (other than for State significant development), if it is of the opinion that the proposed development is likely to have serious and irreversible impacts on biodiversity values.

If the Minister for Planning is of the opinion that proposed State significant development or State significant infrastructure that is the subject of an application to which this Division applies is likely to have serious and irreversible impacts on biodiversity values, the Minister:

> (a) is required to take those impacts into consideration, and
>
> (b) is required to determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted.
>
> If the determining authority is of the opinion that the proposed activity to which this Division applies is likely to have serious and irreversible impacts on biodiversity values, the determining authority:
>
> (a) is required to take those impacts into consideration, and
>
> (b) is required to determine whether there are any additional and appropriate measures that will minimise those impacts if the activity is to be carried out or approved.

One Species Credit species and one threatened ecological community been identified as SAII entities in accordance with the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (OEH 2017b). They are:

- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC

4.1.1 Large-eared Pied Bat

The Large-eared Pied Bat has been identified as a candidate SAII species (**Table 15**) , however it has been assigned an SAII threshold (BioNet [DPIE 2019c]) which is defined as:

> "SAII threshold is potential breeding habitat and presence of breeding individuals. potential breeding habitat and presence of breeding individuals. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. Surveys must be undertaken as per the Threatened Bat Survey Guide to confirm breeding habitat.
>
> Species mapping polygon for breeding habitat must use high resolution aerial imagery and topographic maps to identify features on the subject land (caves, scarps, cliffs etc). Polygon must be at least 100m wide (or 100m diameter for point locations such as caves) with the breeding habitat features (may be multiple) as the centroid (see Threatened Bat Survey Guide). All breeding habitat on or within 100m of the subject land and the area immediately surrounding the feature must be identified.
>
> All habitat on the subject land should also be mapped if present. Use high resolution aerial imagery and topographic maps to identify potential roost habitat features on the subject land within 2km caves, scarps, cliffs etc. Species

polygon boundary should align with PCTs on the subject land to which the species is associated that are within 2km of identified potential roost habitat features."

Land Eco Consulting did not identify any caves, overhangs, crevices, cliffs, escarpments, old mines, tunnels, culverts or derelict concrete buildings on or within 100m of the Subject Land. Therefore, the proposed development does not trigger the requirement to further asses Large-eared Pied Bat as an SAII.

Even though it does not qualify as an SAII on the Subject Land, the Large-eared Pied Bat will still require offset as a species credit owing to its presence on the Subject Land, and the presence of foraging habitat within 1km of sandstone crevices and overhangs.

Table 15. Identification and justification for species considered to be at risk of Serious and Irreversible Impacts (OEH 2017b).

Species	Criteria for identifying potential entities	Justification for listing	Threshold for consideration of SAII	Present on the Subject Land?
Large-eared Pied-bat	Principle 4 - species or ecological community that is unlikely to respond to management and is therefore irreplaceable	Species dependent on non-responding attribute (maternity caves).	Los of potential breeding habitat and presence of breeding individuals. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings.	The species was confirmed present, however, not in the capacity of an SAII.

4.1.2 Shale Sandstone Transition Forest in the Sydney Basin Bioregion

There are no impact thresholds to define when an impact will cause an SAII upon Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC. This means that any impact on the potential habitat for these species could be considered 'serious and irreversible' (**Table 15; Table 16**). Due to the potential sensitivity of this CEEC to any impact on potential habitat, a determination of whether or not the proposed impacts are serious and irreversible is to be undertaken in accordance with section 10.2.2 of the BAM (OEH 2017b).

The native vegetation identified within the Subject land (PCT 1395) conforms to the Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC. This community is listed as an SAII entity in accordance with the '*Guidance to assist a decision-maker to determine a serious and irreversible impact*' (**Table 16**).

As this CEEC is an SAII entity, there are no impact thresholds for the community. This means that any impact on the community could be considered 'serious and irreversible'. Due to the potential sensitivity of this community to any impact on potential habitat, a determination of whether or not the proposed impacts are serious and irreversible are to be undertaken in accordance with section 3.2 of the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (OEH 2017b; **Table 17**). The final determination of whether an impact is serious and irreversible lies with the consent authority, Wollondilly Council.

Table 16. Identification and justification for the ecological community considered to be at risk of Serious and Irreversible Impacts (OEH 2017c).

Ecological Community	Criteria for identifying potential entities	Justification for listing	Threshold for consideration of SAII
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Principle 1 – species or ecological community currently in a rapid rate of decline Principle 2 – species of ecological communities with very small population size	Geographic distribution is very highly restricted and very large degree of environmental degradation or disruption of biotic processes or interactions	Under development

Table 17. Serious and Irreversible Impact Assessment for Shale Sandstone Transition Forest in the Sydney Basin Bioregion

<table>
<tr><th colspan="2">Serious and Irreversible Impact (SAII)
Impact assessment provisions for ecological communities:

Shale Sandstone Transition Forest in the Sydney Basin Bioregion

BC Act Status: Critically Endangered</th></tr>
<tr><td>a) the action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII</td><td>The proposed development has taken all possible measures to avoid the direct and indirect impact on Shale Sandstone Transition Forest in the Sydney Basin Bioregion. However, the nature and type of development (a retirement village) is not conducive to retention of large trees which may drop limbs at short notice or burn during bushfire events. Further, the location and number of units proposed does not allow the retention of many of the remnant, native trees which currently exist on the Subject Property.

Most of the development-related impact pertains to a ‘derived native grassland’ (DNG) form of Shale Sandstone Transition Forest. This DNG exists as a result of historical clearing, grazing and mowing of the Subject Land. This DNG has a VIS score less than 15, therefor it requires no further assessment under the BAM and no offset.</td></tr>
<tr><td>b) the area (ha) and condition of the threatened ecological community (TEC) to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone</td><td>A total area of 11.4ha of Shale Sandstone Transition Forest occurs on the Subject Land. This was comprised of four condition classes as detailed below.
<table>
<tr><th>Vegetation Zone</th><th>Area (ha)</th><th>Composition Condition Score</th><th>Structure Condition Score</th><th>Function Condition Score</th><th>Vegetation Integrity Score</th></tr>
<tr><td>Condition 1: Remnant (Weedy)</td><td>0.53</td><td>50.5</td><td>66.5</td><td>81.7</td><td>65</td></tr>
<tr><td>Condition 2: Canopy Remnant (Under scrubbed)</td><td>3.84</td><td>35.9</td><td>61.7</td><td>61.6</td><td>51.5</td></tr>
<tr><td>Condition 3: Derived Native Grassland</td><td>6.48</td><td>13.8</td><td>42.2</td><td>4.7</td><td>13.9</td></tr>
<tr><td>Condition 4: Exotic dominant</td><td>0.53</td><td>0.7</td><td>0</td><td>14.8</td><td>0.5</td></tr>
</table></td></tr>
<tr><td>c) a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guideline for determining an SAII</td><td>Thresholds for ecological communities have not yet been determined by the OEH. Using the precautionary principle, it is currently assumed that the threshold for Shale Sandstone Transition Forest is 0ha. The proposed development will remove 11.4ha of Shale Sandstone Transition Forest above the threshold. Of this area, the majority of vegetation was of such poor quality that it had a VIS Score <15 and therefore required no further assessment or offset. The remaining area (4.37ha) had a VIS Score of 35.9 (3.84ha) and 50.5 (0.53ha). The VIS scores across the Subject Land were low and reflective of the historically disturbed and isolated condition of Shale Sandstone Transition Forest on the Subject Land.</td></tr>
<tr><td>d) the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint</td><td>The Office of Environment and Heritage NSW (2013) ‘Remnant Vegetation of the western Cumberland subregion, 2013 Update’ mapping indicates the presence of 264 ha of Shale Sandstone Transition Forest within an area of approximately 1,000ha surrounding the development footprint, and 1,698ha of Shale Sandstone Transition Forest within an area of approximately 10,000ha surrounding the development footprint (Figure 13). Overall condition of this vegetation cannot be determined for such an area without extensive ground truthing, such has not been undertaken.</td></tr>
</table>

Serious and Irreversible Impact (SAII) Impact assessment provisions for ecological communities: **Shale Sandstone Transition Forest in the Sydney Basin Bioregion**		
e) an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration	Tozer et al. (2010) 'Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands' indicates the presence of 9,600ha extant within the Sydney Basin Bioregion (most of which is in the Cumberland IBRA Subregion). Tozer (2010) estimated: 20-40% of the original pre-European extent remains. The proposed development will result in a reduction of the total extent of the TEC by a maximum of 11.4ha. Of this only 4.4ha was of a condition reasonable enough to warrant further assessment in accordance with the BAM.	
f) an estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and the IBRA subregion	Tozer (2010) states that the estimated area in conservation reserves is 240ha. Most of this is expected to occur in the Cumberland IBRA Subregion of the Sydney Basin IBRA Bioregion.	
g) the development, clearing or biodiversity certification proposal's impact on:	**i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns**	The proposed development may result increase in water runoff and nutrients into adjacent areas (outside of the Subject Land) which support Shale Sandstone Transition Forest. However, it is unlikely that the proposed development will exacerbate abiotic factors given the location of the Shale Sandstone Transition Forest in an already disturbed and urbanised area. This area is already historically cleared and managed (by mowing). The land is also already exposed to high levels of nutrients and runoff from surrounding residential areas, which is emphasised by high levels of weed infestations within the Subject land. All existing drainage lines and dams will be removed to facilitate the proposed development. Since all of the native vegetation on the Subject Land will be removed, it is not expecting that the changes to hydrology will further impact upon the TEC in the locality.
	ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants	The area of Shale Sandstone Transition Forest within the Subject land is already substantially degraded. It contains minimal midstorey species and is weed infested. Fire and flood regimes have also been largely altered due to past land management practices and the surrounding residential development. It is therefore highly unlikely that the proposed development will exacerbate impacts on characteristic and functionally important species as the area is already highly altered and degraded.
	iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC	The proposed development is unlikely to enhance weed infiltration into adjacent habitat by an increase in edge effects given the surrounding habitat has been historically cleared and exposed to ongoing management through mowing and fertiliser application. The abundance of invasive species within the Subject land is already apparent, and the current vegetation is of moderately low quality. Given the location is in a highly urbanised and fragmented area, it unlikely the proposed development will significantly impact on the quality and integrity of Shale Sandstone Transition Forest within adjacent land.
h) direct or indirect fragmentation and isolation of an important area of the potential TEC	The entire patch of connected Shale Sandstone Transition Forest is separated from other patches of potential Shale Sandstone Transition Forest by roads and existing residential development. It is unlikely that the removal of this degraded vegetation from the Subject Land will significantly impact further on the fragmentation of Shale Sandstone Transition Forest on the Subject land and surrounding areas.	
i) the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.	The proponent aims to contribute to the recovery of this TEC in the IBRA subregion through retiring of offset credits.	

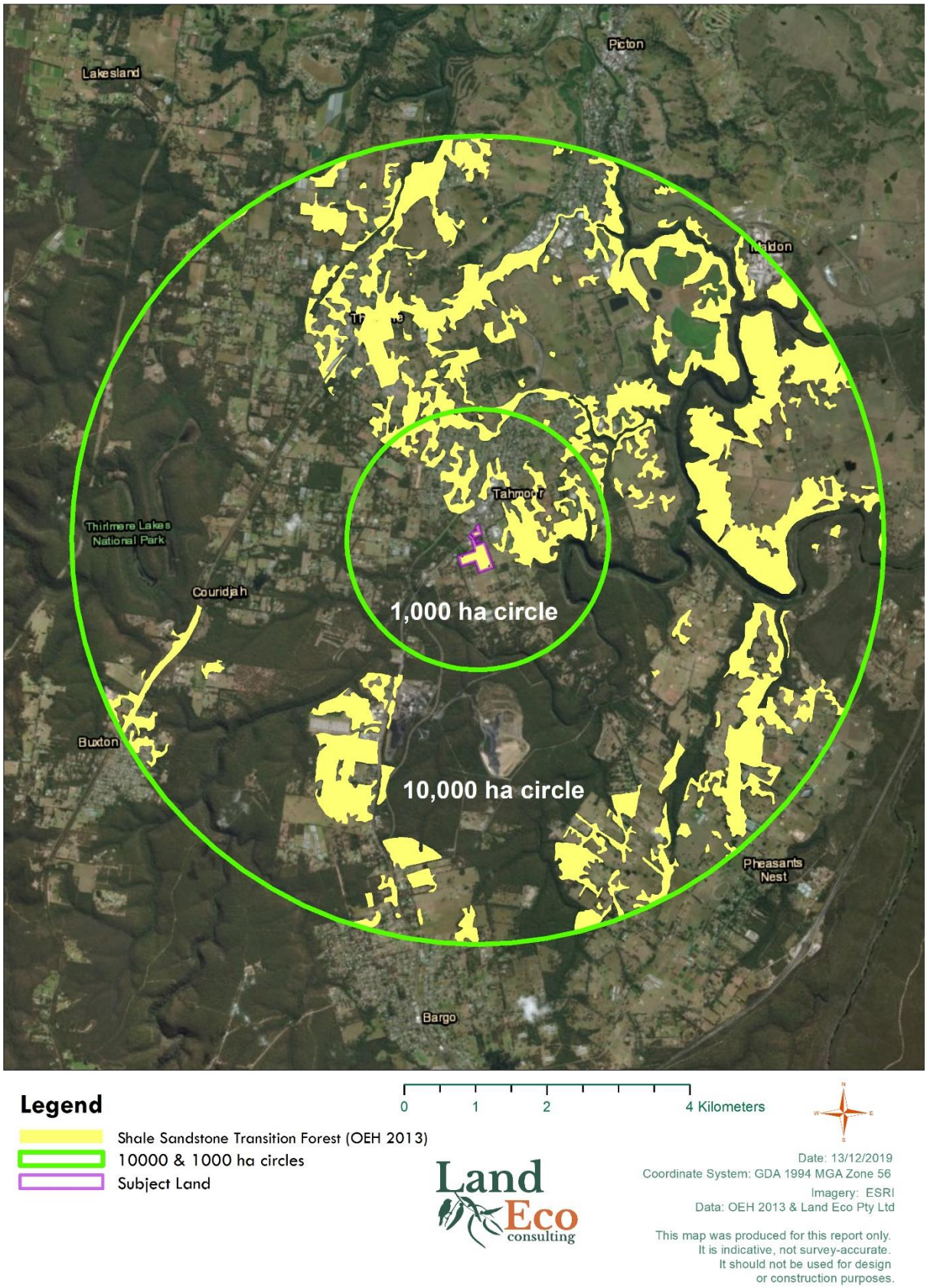

Figure 13. Area of Shale Sandstone Transition Forest (Ha) within 1,000ha and 10,000ha areas surrounding the Subject Land.

4.2 Other Impacts

4.2.1 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the Subject Land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. The indirect impacts of this proposed development are outlined in **Table 18.**

Table 18. Indirect Impacts Summary

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	Shale Sandstone Transition Forest All potentially occurring threatened species.	The proposed development may increase surface run-off into the adjacent habitat which may in turn increase weed infestations within the habitat.	Weed intensity may reduce native vegetation integrity.
(b) reduced viability of adjacent habitat due to edge effects	Shale Sandstone Transition Forest All potentially occurring threatened species.	The proposed construction may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. This impact is likely to be restricted to the immediate area surrounding the construction footprint to a couple of metres.	Edge effects may increase weed intensity and reduce vegetation integrity.
(c) reduced viability of adjacent habitat due to noise, dust or light spill	Shale Sandstone Transition Forest All potentially occurring threatened species.	The removal of mature canopy trees may slightly increase light or wind into adjacent habitat. Construction works may also increase noise. However, as the vegetation is located in an urbanised area, such issues are already present within the Subject Land and surrounds. It is therefore unlikely the proposed works will significantly exacerbate any of these issues.	N/A
(d) transport of weeds and pathogens from the site to adjacent vegetation	Shale Sandstone Transition Forest All potentially occurring threatened species.	The proposed construction may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. This impact is likely to be restricted to the immediate area surrounding the development to a couple of metres.	Edge effects may increase weed intensity and reduce vegetation integrity.
(e) increased risk of starvation, exposure and loss of shade or shelter	All potentially occurring threatened species.	It is unlikely that any threatened fauna relies on habitat within the Subject Land, such that the proposed impacts will lead to increased risks from starvation, exposure, shade and shelter. Adjacent bushland will provide more optimal habitat for any species potentially affected.	N/A
(f) loss of breeding habitats	All potentially occurring threatened species.	The proposed development will not remove any important breeding habitats as the site is already highly disturbed and historically cleared.	N/A
(g) trampling of threatened flora species	Nil	No threatened flora species were identified within the Subject Land. However, this risk cannot be ruled-out.	N/A

Indirect Impact	Impacted entities (threatened species and/or threatened ecological communities and their habitats)	Extent and duration	Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats.
(h) inhibition of nitrogen fixation and increased soil salinity	Nil	It is unlikely that these issues affect the Subject Land, nor is it likely that the proposed development will exacerbate such impacts.	N/A
(i) fertiliser drift	Shale Sandstone Transition Forest	This issue is not likely to affect the vegetation on the Subject Land. Fertiliser usage will be managed in accordance with the site BMP.	N/A
(j) rubbish dumping	Shale Sandstone Transition Forest	This issue is not expected to be exacerbated as a result of the proposed development. Rubbish disposal will be managed in accordance with the site CEMP and BMP.	N/A
(k) wood collection	Shale Sandstone Transition Forest	This issue is not likely to affect the vegetation on the Subject Land. There is limited woody debris on the ground in its current condition.	N/A
(l) bush rock removal and disturbance	Nil	This issue is not relevant to the Subject Land as there is no bush rock.	N/A
(m) increase in predatory species populations	Nil	The Subject Land is already inhabited by predatory pest species, most notably fox. Therefore, it is unlikely that the proposed works will increase predatory species populations. A Pest Management Plan will be prepared to manage the existing issue fox on the Subject Land.	N/A
(n) increase in pest animal populations	Nil	The Subject Land is already highly degraded and supports a strong population of red fox, brown hare and common rabbit, therefore, it is unlikely that the proposed works will significantly increase pest species populations on the subject land or surrounds. A Pest Management Plan will be prepared to manage the existing issue fox on the Subject Land.	N/A
(o) increased risk of fire	Nil	It is unlikely that the proposed development will increase risk of fire to any bushland in or around the Subject Land. It is more likely that the development will reduce local fire risk as a result of removing fuels.	N/A
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Nil	The proposed development will not result in the removal of any important breeding or foraging habitat for threatened species. Other than through direct loss of trees, which is already being address through offsetting.	N/A

4.2.2 Prescribed and Uncertain Impacts

This list of impacts includes all of those impacts on biodiversity values not caused by direct vegetation clearing or development that have been prescribed by the *Biodiversity Conservation Regulation 2017*.

Prescribed biodiversity impacts require an assessment of the impacts of development on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance. This is discussed in **Table 19** below.

Table 19. Prescribed and Uncertain Impacts.

Will there be impacts on any of the following	Yes/No	If Yes, Address all assessment questions from section 9.2.1 of the BAM
Species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance	No	There are no karst, caves, crevices, cliffs and other features of geological significance on or near the Subject Land.
Habitat of threatened species or ecological communities associated with rocks	No	There are no rocks important to threatened species or ecological communities on the Subject Land.
Habitat of threatened species or ecological communities associated with human made structures	No	There are no threatened species or ecological communities located within the Subject Land that are associated with human made structures.
Habitat of threatened species or ecological communities associated with non-native vegetation	No	There will be no impact to the habitat of threatened species or ecological communities associated with non-native vegetation. Non-native vegetation within the Subject Land consisted of degraded paddocks infested with environmental weeds.
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Yes	**(a) identify the area/s of connectivity joining different areas of habitat that intersect with the subject land and the areas of habitat that are connected according to Paragraph 4.2.1.3** Habitat connectivity continues to exist along the southern-eastern and north-western boundary of the Subject Land, which connects to areas of extensive native vegetation to the east and west of the Subject Land. These connection points are minor (**Figure 9**) and are comprised of canopy trees with cleared understorey, rather than intact/remnant bushland. **(b) identify the species and ecological communities likely to benefit from the Connectivity** All the Ecosystem Credit species predicted in this assessment, and all of the candidate species credit species that are assumed present are likely to benefit from the connectivity. **(c) describe the nature, extent and duration of short and long-term impacts** All connective links currently present on the Subject Land will be permanently removed from the Subject Land to facilitate the development. The impacts are permanent and irreversible, however are not expected to be significant to any of the potentially occurring threatened species and TEC. Extensive Shale Sandstone Woodland will continue to exist in the surrounding landscape. Significant habitat corridors will continue to exist in the surrounding landscape to the south of the Subject Land post development (**Figure 9**). **(d) describe, with reference to relevant literature and other reliable published sources of information, the importance of the area of connectivity within the bioregion** While all areas of habitat connectivity have value to biodiversity, it is not expected that the small, historically altered/degraded habitat connections that exist on the Subject Land are important for movement of species or ecological communities within and across the Sydney Basin Bioregion. Extensive connectivity will continue to occur in Tahmoor and the greater landscape. **(e) predict the consequences of the impacts for the bioregional persistence of the suite of threatened species and communities currently benefitting from the connectivity with reference to relevant literature and other published sources of information and taking into consideration mobility, abundance, range and other relevant life history factors.**

Will there be impacts on any of the following	Yes/No	If Yes, Address all assessment questions from section 9.2.1 of the BAM
		While it is possible for mobile threatened species to utilise the Subject Land on occasion, no threatened species were found on the Subject Land during the extensive targeted survey effort. Further, the habitat is of low quality and condition such that it is not considered to be important to the bioregional persistence of all of the ecosystem and species credit species that are assumed present on the Subject Land. The condition of the Shale Sandstone Transition Forest on the Subject Land is low quality. All condition classes of this vegetation on the Subject Site have low VIS scores which reflects this low quality. The best quality patches are small, and historically disturbed from clearing and under scrubbing. The trees that remain on the Subject Land are locally common. It is not expected their propagules are essential for the bioregional persistence of the TEC.
Movement of threatened species that maintains their life cycle	No	While it is possible for mobile threatened species to utilise the Subject Land on occasion, no threatened species were found on the Subject Land during the extensive targeted survey effort. Further, the habitat is of low quality and condition such that it is not considered to be important to the bioregional persistence of all of the ecosystem and species credit species that are assumed present on the Subject Land. Habitat connectivity continues to exist along the southern-eastern and north-western boundary of the Subject Land, which connects to areas of extensive native vegetation to the east and west of the Subject Land. These connection points are minor (**Figure 9**) and are comprised of canopy trees with cleared understorey, rather than intact/remnant bushland. The Subject Land is bound by roads and urban residential properties, therefore the only connectivity. It is unlikely that the removal of any canopy trees will significantly interrupt connectivity for any threatened fauna or flora individuals and their propagules to traverse the landscape
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)	No	Two small, isolated farm dams will be removed. It is unlikely that these dams will sustain threatened species or threatened ecological communities in the locality.
Wind turbine strikes on protected animals	No	There are no wind turbines proposed on the Subject Land.
Vehicle strikes on threatened species of animals or on animals that are part of a TEC	No	It is unlikely that vehicle strikes will be an issue given the proposed development consists of a residential estate with a designated, slow speed limit.

5. Avoid and Minimise Impacts

5.1 Impact Mitigation and Minimisation Measures

This section of the report details recommended efforts to avoid and minimise impact on biodiversity values associated with the proposed development. Measures to be implemented before, during and post construction to avoid and minimise the impacts of the project are detailed in (**Table 20**). The final project footprint including construction and operation is presented as the 'Subject Land' in **Figure 1**.

Considering the nature and scale of the proposed development; the character of the study area; the historic disturbance and fragmentation, and maintenance of vegetation within the Subject Property in conjunction with the proposed impact mitigation measures, there are unlikely to be any appreciable indirect impacts on biodiversity arising from the proposal that have not been addressed in **Table 20** below. Only the direct impacts associated with vegetation clearing and construction of the proposal will require biodiversity offsets according to the BAM. The Biodiversity Offset Credit obligations required for the proposed development are detailed in **Section 6.9** below.

Table 20. Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project

Impact / Action	Outcome	Timing	Responsibility
Project Location	The project location lies between an area that has been historically cleared and grazed. The surrounding land use is urban. The property was chosen for development as it is mostly cleared. This negates the need to undertake clearing of larger, remnant bushland areas in the greater the Tahmoor area. Owing to the project location, the proposal is unlikely to significantly exacerbate the fragmentation of native vegetation, or impact on any preferential fauna habitat despite requiring the removal of small areas of remnant native vegetation. The Ecologist site assessment revealed that there are minimal alternative locations available for the project location within the Subject Property.	Pre-construction phase	Proponent
Project Design	The proposed development requires the clearing of all vegetation within the Subject Land. This impact is unavoidable however, minimal loss to regional biodiversity will occur due to the location of the site within a historically cleared/ degraded area.	Pre-construction phase	Proponent
Project Planning	The proponent will prepare a Construction Environmental Management Plan (CEMP) to manage construction activity. Following a construction, the on-going landscaping and management of the Subject Land should be undertaken in line with a Biodiversity Management Plan (BMP) which will detail, on-going, habitat management, weed management, flora plantings and maintenance.	Pre-construction phase	Proponent Engineer Ecologist
Assigning a Project Ecologist	Prior to construction, the proponent will commission the services of a qualified and experienced Ecologist Consultant (>3 years of experience) with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management. The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act. The Ecologist must be a member of the NSW Ecological Consultants Association. The Ecologist will be commissioned to: Assist the proponent in identifying and assigning an appropriate skilled bushland restoration professional to implement vegetation restoration; help the proponent undertake any Threatened species habitat augmentation or translocation; Undertake any required targeted searches for Threatened flora prior to vegetation clearing; Undertake an extensive pre-clearing survey; delineating habitat-bearing trees and shrubs to be removed; and Supervise the clearance of trees and shrubs (native and exotic) in order to capture, treat and/or relocate any displaced fauna.	Prior to vegetation clearance works	Proponent
Preparation of a Construction Environmental Management Plan (CEMP)	A Construction Environmental Management Plan (CEMP) will be required for the construction phase of the project and will be prepared prior to issue of the Construction Certificate. The CEMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the procedures outlined below. The proposed mitigation measures would include environmental safeguards for protection of neighbouring properties and nearby waterways in accordance with relevant policy documentation and	Pre-construction phase	Proponent Project Ecologist Construction Contractor

Impact / Action	Outcome	Timing	Responsibility
	Government guidelines. In order to address the potential impacts of the proposal on biodiversity, the mitigation and management measures outlined within this table would be implemented as part of the CEMP for the site.		
Tree Protections	Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970) outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on construction sites. It is an area isolated from construction disturbance so that the tree remains viable. Ideally, works should be avoided within the TPZ. A Minor Encroachment is less than 10% of the TPZ and is outside the SRZ. A Minor Encroachment is considered acceptable by AS-4970 when it is compensated for elsewhere and contiguous within the TPZ. A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. Major Encroachments generally require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods.	Pre-construction phase	Arboricultural Professional
Clearing of vegetation/ fauna habitat	In preparation for the authorised clearing of native vegetation, the following conditions should be adhered to in order to minimise all potential impacts to native biodiversity values within the Subject Land: Before any vegetation is damaged or removed, a qualified Ecologist will be assigned to undertake a pre-clearing survey to delineate areas permitted to be cleared, from areas that must be retained. Brightly coloured bunting or strong flagging tape should be used. Prior to vegetation being damaged or removed, a qualified Ecologist with fauna identification experience should determine the presence of any suitable habitat for roosting microbats, nesting birds or other fauna in the area of the Subject Land due to be cleared. All trees (including dead trees) should be felled by qualified Arborists using chainsaw and pulleys only. No heavy machinery is permitted for removal of any tree. A qualified Project Ecologist with experience in handling wildlife should be present on the site during all vegetation clearing in order to supervise clearing and capture and relocate any displaced, healthy animals, or care for/ rehabilitate any injured or orphaned animals.	Prior to vegetation clearance works	Proponent Project Ecologist Arboricultural Professional
Salvage and Relocation of Woody Debris	Where possible, all woody debris (fallen trees and logs) within the Subject Land are to be retained. Logs from the felling of mature canopy trees should be relocated, as directed by the Project Ecologist, to an area of native vegetation within areas of bushland located outside of the Subject Land. All tree crowns, roosts, foliage, cones and seeds must be removed prior to translocation to maximise avoidance of the accidental spreading of pathogens or weed propagules.	Construction phase	Project Ecologist Proponent Bush Regeneration Contractor
Landscaping and Bushland Restoration	To mitigate the removal and on-going indirect impacts to bushland, it is proposed that any landscaping to be undertaken around native trees within the Subject Land use flora species representative of locally indigenous vegetation community Shale Sandstone Transition Forest. Planting and restoration efforts should be managed under a Biodiversity Management Plan (BMP).	During and Post Construction	Proponent Project Ecologist Bush Regeneration Contractor
Erosion and Sedimentation	Appropriate erosion and sediment control must always be erected and maintained during construction in order to avoid the potential of incurring indirect impacts on biodiversity values. As a minimum, such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004).	Construction phase	Proponent Construction Contractor
Erection of Temporary Fencing	Temporary fencing should be erected around the Subject Land to mitigate indirect impacts on biodiversity (e.g. retained trees and vegetation located on nature strips and adjoining properties).	Pre and during Construction phase	Proponent Construction Contractor
Storage and Stockpiling (Soil and Materials)	Allocate all storage, stockpile and laydown sites away from any native vegetation that is planned to be retained. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site in order to avoid the potential of incurring indirect impacts on biodiversity values.	Construction phase	Construction Contractors
Stormwater and Wastewater	All stormwater and sewage disposal and transport systems must be appropriately designed by Engineers. Potential impacts relating to stormwater and runoff will be managed during construction and operation phases in accordance with engineers plans. The CEMP will guide stormwater management during the construction phase of development.	During and Post-construction phase	Proponent Construction Engineer Architect

Impact / Action	Outcome	Timing	Responsibility
Mitigating Urban Heat Island Effects	Maximise plantings of trees, particularly native trees as part of landscaping efforts in attempt to enhance shade and reduce long-wave heat radiation in the Subject Land and surrounding landscape. Manage tree planting and maintenance under a Landscape Plan and BMP.	Prior and Post construction.	Proponent Architect Landscape Architect Ecologist
Mitigating effects of Light Spill	Lighting will be minimised to wherever it is required. Lighting will be turned off at designated times in the evening to reduce impacts of light spill on biodiversity and the environment. To reduce impacts on fauna, lights will not be established in a manner that shines directly into native tree canopies on or surrounding the Subject Land.	Prior and Post construction.	Proponent Architect Landscape Architect Ecologist
Preparation of a Pest Management Plan	It is unlikely that the development will exacerbate pests, however, since pests (red fox, brown hare and common rabbit) are confirmed present on the Subject Land it is considered beneficial for the proponent to prepare Pest Management Plan and implement a long-term pest management program to manage pests, particularly foxes and rabbits.	Post construction.	Proponent Ecologist Licensed Pest Manager
Preparation of a Biodiversity Management Plan (BMP)	The on-going landscaping and management of the Subject Land should be undertaken in line with a Biodiversity Management Plan (BMP) which will be prepared by a qualified Ecologist. This document will detail, on-going, habitat management, weed management, flora plantings and maintenance. It will result in best practice biodiversity management on the Subject Land to the benefit of the locality.	Prior and post construction phase.	Ecologist

6. Other Relevant Legislation, Plan & Policies Requiring Address

6.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

One EPBC Act listed Critically Endangered Ecological Community (CEEC) was located within the Subject Land, *Shale Sandstone Transition Forest in the Sydney Basin Bioregion*. Suitable habitat for several EPBC Act (Commonwealth) threatened fauna species was also present in the Subject Land. Separate to this report, a referral of the proposed development will be submitted to the Minister (Commonwealth) to assess potential impacts to any Matters of National Significance (MNES) within the site. EPBC Act MNES are not be addressed further in this report.

6.2 Groundwater Dependent Ecosystems

The Commonwealth Groundwater Dependent Ecosystem (GDE) Policy defines GDEs as ecosystems, which have their species composition and their natural ecological processes determined by groundwater (DLWC 2002). The Policy defines groundwater as the water beneath the earth's surface that has filtered down to the zone where the earth or rocks are fully saturated (DLWC 2002). Ecosystems vary dramatically in the degree of dependency of groundwater, from having no apparent dependence through to being entirely dependent on it (DLWC 2002). The Australian Government Atlas of Groundwater Dependent Ecosystems (BOM 2019a) was used to identify any previously mapped GDEs that occur in or near the Subject Land. This atlas identifies GDEs reliant on surface groundwater (rivers, springs and wetlands) and subsurface groundwater (vegetation).

The GDE Atlas was reviewed and it was identified that the Subject Land does not contain a GDE (DLWC 2002). During on-ground surveys no GDE were evident.

6.3 State Environmental Planning Policy No. 44 – Koala Habitat Protection

SEPP 44 - Koala Habitat Protection only applies to land which:

- (i) has an area of more than 1 hectare; or
- (ii) has, together with any adjoining land in the same ownership, an area of more than 1 hectare whether or not the development application applies to the whole, or only part, of the land.

The State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) applies to all local government areas (LGAs) listed on Schedule 1 of the policy, except land dedicated under the *National Parks and Wildlife Act 1974* or the *Forestry Act 1916*. The identification of an area of land as SEPP 44 Potential Koala Habitat is determined by the presence of Koala feed tree species listed within Schedule 2 of the policy. The Subject Land is situated within Wollondilly LGA, which is listed on Schedule 1 of the policy. Only one Koala feed tree (*Eucalyptus punctata*) was identified within the Subject Land and this represented less than 5% of the total trees/canopy on the Subject Land. No visual observation of a breeding Koala has been recently recorded within 10km of the Subject Land. The Subject Property does not constitute Potential or Core Koala Habitat therefore a Koala Plan of Management is not required for the Subject Property.

6.4 State Environmental Planning Policy No 19 - Bushland in Urban Areas (SEPP 19)

The Subject Land does not directly border any Council-mapped Bushland Reserves or land designated for Open Space.

6.5 State Environmental Planning Policy Coastal Management

The State Environmental Planning Policy (Coastal Management) 2018 applies to land within the Coastal Zone and aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016*.

The Subject land is not located within the Coastal Zone and as a result, does not require further assessment as per this SEPP (SEPP Coastal Management 2018).

6.6 Wollondilly Local Environmental Plan 2011

6.6.1 Zoning

Under the Wollondilly Local Environmental Plan (2011), the majority of the Subject Land is zoned 'RU4 –

Primary Production Small Lots,' with the north-east corner zoned 'R2 – Low Density Residential.'

The objectives of Zone 'RU4 – Primary Production Small Lots- include:

- To enable sustainable primary industry and other compatible land uses.
- To encourage and promote diversity and employment opportunities in relation to primary
- industry enterprises, particularly those that require smaller lots or that are more intensive in nature.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To provide areas within which the density of development is limited in order to maintain a
- separation between urban areas.

The objectives of Zone 'R2 – Low Density Residential' include:

- To provide for the housing needs of the community within a low-density residential environment.
- To enable other land uses that provide facilities or services to meet the day to day needs of residents.

6.6.2 Biodiversity Protection

Part 7.2 'Biodiversity Protection' of the Wollondilly LEP 2011 applies to land identified as "sensitive land"

on the Natural Resources Biodiversity Map. The objectives of this clause are to maintain terrestrial and

aquatic biodiversity including:

- protecting native fauna and flora, and
- protecting the ecological processes necessary for their continued existence, and
- encouraging the recovery of native fauna and flora and their habitats, and
- protecting water quality within drinking water catchments.

This clause does not apply to the Subject Land as it is not categorised as "sensitive land" as per the Wollondilly LEP 2011.

6.7 Wollondilly Development Control Plan 2016

6.7.1 Tree Removal

Part 10 'Tree Removal' of the Wollondilly Development Control Plan (2016) sets out a number of controls relating to tree removal including:

- Any of the following tree removal activities can be carried out without the need to obtain either
    - a tree removal permit of development consent from Council:
    - Removal of vegetation that is declared a noxious weed by the NSW Government under the Noxious Weeds Act 1993, or a Priority weed species as declared by the Wollondilly Shire Council (unless listed as a heritage item)
    - Removal of vegetation located within 3 metres of an existing lawfully constructed building or access driveway (measured from the external part of the trunk)
    - Removal of native vegetation that Council is satisfied is dying or dead and is not required as the habitat of native fauna. The proponent must provide written justification, including photographs, from an arborist or other suitably qualified person
    - Removal of native vegetation that Council is satisfied is a significant imminent risk to human life or property
    - Removal of vegetation being carried out under legislation listed in clause 10.3 Vegetation to be pruned as part of routine pruning of fruit trees, or commercial horticulture or forestry operation
    - Amenity Pruning within Australian Standards
- The Council may issue a permit for the removal of no more than 5 trees provided that:
    - The tree does not form part of a heritage site, is within a heritage conservation area, forms part of an aboriginal object or that is within an aboriginal place of significance

- The retention of the tree is not required by a development consent condition
- The tree has not been identified as containing tree hollows or significant habitat or food source
- The tree is not located within 'Biodiversity' or 'Water' Natural Resources Areas under the Wollondilly Local Environmental Plan (2011)
- Must not form part of a vegetation community which has been identified as an endangered ecological community or threatened ecological community under any Act or legislation
- Council has not issued a permit to remove trees or other native vegetation under this clause in the previous two (2) years for the Subject Property

- The Council may issue a permit for the removal of no greater than 50 m2 of native vegetation (other than a tree) provided that no permit to remove trees or other native vegetation under this section has been issued in the previous two (2) years for the subject property.

Any tree or other native vegetation removal which cannot be carried out as exempt development under clause 10.3 or by obtaining a permit under clause 10.4 may only be removed with development consent.

6.7.2 Landscaping

Part 11 'Landscaping' of the Wollondilly Development Control Plan (2016) identifies groundcovers and shrubs, as well as Tahmoor-specific tree species to be used in landscaping (**Table 21**).

Table 21. Suitable trees for landscaping as identified by Wollondilly Development Control Plan 2016

Scientific Name Common Name
Acacia elata Cedar Wattle
Acacia mearnsii Black Wattle
Allocasuarina littoralis Black She-oak
Angophora floribunda Rough-barked Apple
Angophora subvelutina Broad-leaved Apple
Casuarina cunninghamiana River She-oak
Eucalyptus baueriana Blue Box
Eucalyptus crebra Narrow-leaved Ironbark
Eucalyptus globoidea White Stringybark
Eucalyptus haemastoma Scribbly Gum
Eucalyptus moluccana Grey Box
Eucalyptus punctata Grey Gum
Eucalyptus tereticornis Forest Red Gum
Eucalyptus viminalis Ribbon Gum
Melaleuca linearifolia -
Melaleuca styphelioides Prickly-leaved Paperbark

6.8 NSW Fisheries Management Act 1994

The proposed development will not impact upon any habitat for threatened fish as listed under the *NSW Fisheries Management Act 1994*, neither will the development impact upon any Key Fish Habitat.

6.9 Biodiversity Offset Credit Requirements

The proponent is required to retire biodiversity offset credits in order to meet their obligations to offset the residual impacts of the proposed DA. The proponent may purchase and retire the appropriate credits from Biodiversity Stewardship Sites that comply with the trading rules of the BOS in accordance with the 'like for like' report generated by the Biodiversity Assessment Method Calculator (Section 9 – Biodiversity Credit Report). Alternatively, the proponent can meet their offset obligations by making a payment directly into the NSW Biodiversity Offsets Payment Fund.

6.9.1 Offset Requirement for Ecosystem Credits

A total of 146 Ecosystem Credits are required to offset the biodiversity impacts of the proposed development. Estimated costs to purchase these credits, or alternatively, to allocate offset funds directly into the NSW Biodiversity Conservation Trust (BCT) are available in the NSW Biodiversity Offsets Payment Calculator (DPIE 2019b). These values are presented in **Table 22.**

Table 22. Ecosystem credits required to offset the proposed development.

Plant Community Type (PCT)	BC Act Status	Total Area (ha)	Number of Ecosystem Credits to Retire
PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	11.4	146

6.9.2 Offset Requirement for Species Credits

Due to the requirement to submit the proposed development application promptly, targeted survey could not be undertaken for all of the candidate Species Credit species within the optimal survey timeframe as advised by OEH (see **Table 13**).

A total of nine candidate Species credit species will require offsetting through the retiring of biodiversity offset species credits under the BOS as a result of the proposed development (**Table 23**).

Estimated costs to purchase these credits, or alternatively, to allocate offset funds directly into the NSW Biodiversity Conservation Trust (BCT) are available in the NSW Biodiversity Offsets Payment Calculator (OEH 2019c).

Table 23. Species Credits required to offset the proposed development.

Species	BC Act Status	Number of Species Credits to Retire
Chalinolobus dwyeri Large-eared Pied Bat	Vulnerable	174
Myotis macropus Southern Myotis	Vulnerable	116

7. Conclusion

This BDAR has been prepared by Land Eco to identify the potential impacts of the proposal on biodiversity values within the Subject Land. This assessment has been completed in accordance with the Biodiversity Assessment Method and includes:

- Detailed literature review and desktop assessment to describe the environment and landscape features of the Subject Land and to identify the suite of threatened biota potentially affected by the proposal;
- Site assessment to describe the biodiversity values of the Subject Land and to determine the likelihood of threatened biota and their habitats occurring within the proposed activity footprint;
- Targeted field surveys for a suite of candidate Species Credit species identified by the Biodiversity Assessment Method Calculator as likely to occur within the native vegetation of the Subject Land in accordance with the relevant NSW threatened species survey guidelines;
- Discussion and recommendation of measures to avoid and minimise impacts to biodiversity values;
- Discussion on impacts to biodiversity values including Serious and Irreversible Impacts; and
- Biodiversity Assessment Method calculations using the Biodiversity Assessment Method Calculator 1.2.7.2 to quantify the level of biodiversity impacts of the proposal following the implementation of measures to avoid and minimise impacts, and to determine the biodiversity credits that will need to be purchased and retired to offset the residual impacts of the proposal.

The Subject Land has been historically cleared and where canopy remnants remain, most of this has been under scrubbed. A substantial area located in the north-east is planted with ornamental trees, shrubs and groundcovers. The remaining majority of the Subject Land comprises historically cleared native grassland. The proposed development has been designed to minimise impacts on biodiversity values as far as practicable and requires the removal of approximately 11.3 ha of native vegetation.

The proposed development is expected to result in clearing and associated impact (11.3ha) to one distinct plant community type (PCT):

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

The area of PCT 1395 within the Subject Land comprises an occurrence of *Shale Sandstone Transition Forest in the Sydney Basin Bioregion*, which is listed as a Critically Endangered Ecological Community and Serious and Irreversible Impact (SAII) entity under the NSW *Biodiversity Conservation Act 2016*. This vegetated area consisted of three condition classes as follows:

- Condition Class 1: PCT 1395 Weed Infested Remnant (0.5 ha)
- Condition Class 2: PCT 1395 Canopy Remnant (3.8 ha)
- Condition Class 3: PCT 1395 Derived Native Grassland (6.5 ha)
- Condition Class 4 -PCT 1395 Exotic Dominant (0.5 ha)

Class 4 and Class 3 scored such low Vegetation Integrity Scores (VIS) that they require no assessment of threatened species habitat and will generate no offset obligation in accordance with the BOS.

The following Ecosystem Credits are required to be retired to offset the biodiversity impacts of the proposal:

- 146 Ecosystem Credits of PCT 1395-Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion (Shale Sandstone Transition Forest in the Sydney Basin Bioregion).

Once the proponent meets their offset obligations, the project will incur no significant or serious and irreversible impact upon Shale Sandstone Transition Forest in the Sydney Basin Bioregion.

The following Species Credits must be surveyed in order to confirm their absence from the Subject Land. The proponent desires to submit this BDAR to Council with their DA assuming that during the period of time that the DA is being assessed, the proponent will undertake targeted survey for the residual Species Credit species that could not be surveyed-for in the leadup to DA submission.

- 174 Species Credits of *Chalinolobus dwyeri* (Large-eared Pied Bat)
- 116 Species Credits of *Myotis macropus* (Southern Myotis)

In addition to offsetting, the *Biodiversity Conservation Act 2016* requires that an applicant takes all reasonable effort to avoid and minimise potential impacts of the proposal on local biodiversity values. A series of mitigation and management measures have been identified, which are to be implemented as part of any construction environmental management plan produced for the site. These include measures to:

- Ensure all contractors employed to work within the Subject Land are suitably qualified, experienced and informed of the sensitive ecological features and potentially occurring threatened species;
- Assign a Project Ecologist to conduct and oversee all ecological compliance requirements associated with conducting a proposed development in line with all relevant state and commonwealth legislation and guidelines;
- Have an ecologist present during the clearing of all vegetation both native and exotic related to the proposed activity;
- Incorporate locally indigenous flora species representative of Shale Sandstone Transition Forest in the Sydney Basin Bioregion in soft landscaping associated with the development wherever possible;
- Implement vertebrate pest control during construction and operation of the development;
- Implement all relevant biological hygiene protocols and requirements as per NSW Government guidelines.
- Ongoing management of priority weeds according to statutory requirements.
- Prescribed fencing and vegetation exclusion requirements.

During operation there is potential for the proposal to indirectly impact surrounding vegetation and habitat values through:

- Introduction of weed propagules by vehicle and increased edge effects.
- Increase in vertebrate pests, particularly Cat, Fox and Rabbit.
- Erosion and sedimentation as a result of runoff from hard stand areas.
- Generation of additional light and noise (particularly during construction)

State Environmental Planning Policy No.44 has been assessed, and the Subject Land does not contain 'Potential' or 'Core' Koala Habitat. There is no need for a Koala Plan of Management.

The proponent is required to retire biodiversity offset credits in order to meet their obligations to offset the residual impacts of the proposed DA. The proponent may purchase and retire the appropriate credits from Biodiversity Stewardship Sites that comply with the trading rules of the BOS in accordance with the 'like for like' report generated by the Biodiversity Assessment Method Calculator (Section 9 – Biodiversity Credit Report). Alternatively, the proponent can meet their offset obligations by making a payment directly into the NSW Biodiversity Offsets Payment Fund.

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9. Appendices

Appendix A. Flora recorded opportunistically within the Subject Land

Appendix B. Fauna recorded within the Subject Land

Appendix C. BAM VIS Field Survey Forms (copied from electronic data sheet)

Appendix D. Biodiversity Credit Reports from Biodiversity Assessment Method Calculator

Appendix E. Species Polygons for Threatened species assumed present within the Subject Land

Appendix A. Flora recorded opportunistically within the Subject Land during the site assessments. HTE indicates high threat exotic species. Additional species are listed in the BAM VIS Plot data sheets.

Scientific Name	Status	Canopy	Mid-storey	Groundcover
Acacia decurrens			x	
Acacia parramatensis			x	
Amyema pendula				x
Andropogon virginicus	High Threat Exotic			x
Araujia sericifera	High Threat Exotic			x
Aristida vagans				x
Asparagus aethiopicus	Priority Weed			x
Asparagus asparagoides	Priority Weed			x
Bidens pilosa	High Threat Exotic			x
Bursaria spinosa subsp. spinosa			x	
Callistemon rigidus			x	
Cassinia aculeata			x	
Cenchrus clandestinum	High Threat Exotic			x
Centella asiatica				x
Cheilanthes sieberi				x
Cirsium vulgare	Exotic			x
Conyza bonariensis	Exotic			x
Cotoneaster glaucophyllus	Exotic		x	
Cryptandra spinescens			x	
Cyperus eragrostis	High Threat Exotic			x
Dichondra repens				x
Echinochloa crus-galli	Exotic			x
Ehrharta erecta	High Threat Exotic			x
Einadia trigonos				x
Einadia hastata				
Einadia nutans subsp. nutans				
Entolasia stricta				x
Eragrostis brownii				x
Eucalyptus crebra		x		
Eucalyptus eugenioides		x		
Eucalyptus fibrosa		x		
Eucalyptus microcorys		x		
Eycalyptus nicholi	Vulnerable (planted non-indigenous)			
Eucalyptus punctata		x		
Eucalyptus globoidea		x		
Glycine tabacina				x
Goodenia hederacea				x
Hardenbergia violacea				x
Juncus prismatocarpus				x
Ligustrum lucidum	High Threat Exotic		x	
Ligustrum sinense	High Threat Exotic		x	
Lomandra multiflora				
Lomandra confertifolia				x
Lomandra filiformis subsp. filiformis				x
Lonicera japonica	High Threat Exotic			x
Melaleuca ericifolia			x	
Melaleuca linariifolia			x	
Melaleuca thymifolia			x	
Melaleuca decora		x		

Scientific Name	Status	Canopy	Mid-storey	Groundcover
Microlaena stipoides var. stipoides				x
Modiola caroliniana	Exotic			x
Olearia viscidula			x	
Onopordum acanthium	Exotic			x
Oxalis perennans				x
Paspalum dilatatum	High Threat Exotic			x
Persicaria lapathifolia				x
Pinus pinaster	Exotic	x		
Pinus patula	Exotic	x		
Pinus radiata	Exotic	x		
Plantago lanceolata	Exotic			x
Pratia purpurascens				x
Quercus robur	Exotic		x	
Rubus fructicosus agg	Priority Weed			x
Rytidosperma fulvum				x
Senecio madagascariensis	Priority Weed			x
Setaria parviflora	Exotic			x
Sida rhombifolia	Exotic			x
Solanum mauritianum	Exotic			x
Solanum nigrum	Exotic			x
Solanum pseudocapsicum	Exotic			x
Sonchus oleraceus	Exotic			x
Sporobolus africanus	Exotic			x
Stellaria media	Exotic			x
Taraxacum officinale	Exotic			x
Themeda triandra				x
Trifolium repens	Exotic			x
Veronica plebeia				x

Appendix B. Fauna recorded on Subject Land during Site Assessments

Class	Scientific Name	Common Name	BC Act
Aves	*Acanthorhynchus tenuirostris*	Eastern Spinebill	Protected
	Acanthiza nana	Yellow Thornbill	Protected
	Acanthiza lineata	Striated Thornbill	Protected
	Accipiter fasciatus	Brown Goshawk	Protected
	Alisterus scapularis	Australian King Parrot	Protected
	Anthochaera carunculata	Red Wattlebird	Protected
	Anthochaera chrysoptera	Little Wattlebird	Protected
	Ardea pacifica	White-necked Heron	Protected
	Cacatua galerita	Sulphur-crested Cockatoo	Protected
	Cacatua sanguinea	Little Corella	Protected
	Cacatua tenuirostris	Long-billed Corella	Protected
	Calyptorhynchus funereus	Yellow-tailed Black Cockatoo	Protected
	Calligavis chrysops	Yellow-faced Honeyeater	Protected
	Chenonetta jubata	Australian Wood Duck	Protected
	Coracina novaehollandiae	Black-faced Cuckoo-shrike	Protected
	Corvus coronoides	Australian Raven	Protected
	Cracticus tibicen	Australian Magpie	Protected
	Cracticus torquatus	Grey Butcherbird	Protected
	Dacelo novaehollandiae	Laughing Kookaburra	Protected
	Dicaeum hirundaceum	Mistletoebird	Protected
	Egretta novaehollandiae	White-faced Heron	Protected
	Eolophus roseicapilla	Galah	Protected
	Eopsaltria australis	Eastern Yellow Robin	Protected
	Eudynamys orientalis	Eastern Koel	Protected
	Eurystomus orientalis	Dollarbird	Protected
	Falco longipennis	Australian Hobby	Protected
	Glossopsitta pusilla	Little Lorikeet	Vulnerable
	Glossopsitta concinna	Musk Lorikeet	Protected
	Grallina cyanoleuca	Magpie-lark	Protected
	Hirundapus caudacutus	White-throated Needletail	Protected (BC Act) Vulnerable; Migratory (EPBC Act)
	Hirundo neoxena	Welcome Swallow	Protected
	Lichenostomus chrysops	Yellow-faced Honeyeater	Protected
	Malurus cyaneus	Superb Fairy-wren	Protected
	Manorina melanocephala	Noisy Miner	Protected
	Manorina melanophrys	Bell Miner	Protected
	Megalurus mathewsi	Rufous Songlark	Protected
	Microeca fascinans	Jacky Winter	Protected
	Meliphaga lewinii	Lewin's Honeyeater	Protected
	Myzomela sanguinolenta	Scarlet Honeyeater	Protected
	Ocyphaps lophotes	Crested Pigeon	Protected
	Pachycephala rufiventris	Rufous Whistler	Protected
	Pardalotus punctatus	Spotted Pardalote	Protected
	Pardalotus striatus	Striated Pardalote	Protected

Class	Scientific Name	Common Name	BC Act
	Philemon corniculatus	Noisy Friarbird	Protected
	Platycercus eximius	Eastern Rosella	Protected
	Podargus strigoides	Tawny Frogmouth	Protected
	Psephodes haematonotus	Red-rumped Parrot	Protected
	Ptilonorhynchus violaceus	Satin Bowerbird	Protected
	Rhipidura albiscapa	Grey Fantail	Protected
	Rhipidura leucophrys	Willie Wagtail	Protected
	Smicrornis brevirostris	Weebill	Protected
	Scythrops novaehollandiae	Channel-billed Cuckoo	Protected
	Streptopelia chinensis	Spotted Dove	Protected
	Sericornis frontalis	White-browed Scrubwren	Protected
	Strepera graculina	Pied Currawong	Protected
	Sturnus tristis	Common Myna	Exotic Pest
	Sturnus vulgaris	Common Starling	Exotic Pest
	Trichoglossus haematodus moluccanus	Rainbow Lorikeet	Protected
	Turdus merula	European Blackbird	Exotic Pest
	Vanellus miles novaehollandiae	Masked Lapwing	Protected
	Zosterops lateralis	Silvereye	Protected
Mammalia	*Macropus giganteus*	Eastern Grey Kangaroo	Protected
	Vulpes vulpes	European Red Fox	Exotic Pest
	Oryctolagus cunniculus	European Rabbit	Exotic Pest
	Lepus europaeus	Brown Hare	Exotic Pest
	Felis catus	Feral Cat	Exotic Pest
	Petaurus breviceps	Sugar Glider	Protected
	Pseudocheirus peregrinus	Common Ring-tailed Possum	Protected
	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable
Amphibia	*Crinia signifera*	Common Eastern Froglet	Protected
	Limnodynastes peronii	Striped Marsh Frog	Protected
	Limnodynastes tasmaniensis	Spotted Marsh Frog	Protected
	Litoria dentata	Bleating Tree Frog	Protected
	Litoria peronii	Peron's Tree Frog	Protected
	Litoria verreauxii	Whistling Tree Frog	Protected
	Uperoleia laevigata	Smooth Gungan	Protected
	Litoria tyleri	Tyler's Tree Frog	Protected
Reptilia	*Lampropholis guichenoti*	Pale-flecked Garden Sun-skink	Protected

Appendix C. BAM VIS Field Survey Forms (copied from electronic data sheet)

Date	Recorder		Report Plot No.	Location	Zone	Bearing	
7 Dec 2019	Kurtis Lindsay		BAM1	Stratford House	Woodland - cleared understorey	60•	
Species List							
Species	**Percent Cover**	**Abundance**	**Native**	**High Threat Exotic**	**Growth Form**	**Summary**	**Total**
Eucalyptus fibrosa	20		N		Tree	**Tree (TG)**	**4**
Eucalyptus crebra	12		N		Tree	**Shrub (SG)**	**2**
Melaleuca thymifolia	2		N		Shrub	**Grass & grasslike (GG)**	**10**
Bursaria spinosa	1		N		Shrub	**Forb (FG)**	**1**
Acacia decurrens	0.5		N		Tree	**Fern**	**0**
Lomandra multiflora	5		N		Grass & Grasslike	**Other (OG)**	**0**
Lomandra filiformis subsp. filiformis	2		N		Grass & Grasslike		
Aristida vagans	10		N		Grass & Grasslike	**HTE%**	**4**
Themeda triandra	20		N		Grass & Grasslike		
Rubus fruticosus	1			HTE			
Lachnagrostis filiformis	0.5		N		Grass & Grasslike		
Cymbopogon refractus	0.5		N		Grass & Grasslike		
Paspalidium distans	1		N		Grass & Grasslike		
Rhytidosperma sp.	2		N		Grass & Grasslike		
Vulpia sp.							
Acacia partamattensis	0.5		N		Tree		
Dianella revoluta	0.5		N		Forb		
Senecio madagascariensis	0.5			HTE			
Pennisetum clandestinum	2			HTE			

Ligustrum sinense	0.5			HTE			
Lomandra gracilis	0.5		N		Grass & Grasslike		
Juncus pauciflorus	0.1		N		Grass & Grasslike		
Plantago lanceolatus							
TOTALS	78.1		17	4			
GF Code	0.1% = 63cm x 63cm; 0.5% = 1.4m x 1.4m; 1% = 2.0m x 2.0m; 5% = 4m x 5m; 25% = 10m x 10m						
Stems, Hollows and Logs							
Trees	**Stems Count**	**Stems with hollows**					
80+ cm	2	0					
50Cm to 79cm	2						
30cm to 49cm	0						
20cm to 29cm	0						
10cm to 19cm	0						
5cm to 9cm	0						
<5cm	3						
Totals							
Length of logs (>10cm diameter and >50cm length)	1.5						
Percent Covers							
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**		
1	25	2	0	0	27		
2	20	1	0	0	21		
3	35	1	0	0	36		
4	5	0	0	0	5		
5	20	1	0	0	21		
Average	21	1	0	0	22		

Date	Recorder		Report Plot No.	Location	Zone	Bearing		
7.12.19	Kurtis Lindsay		BAM2	Stratford House	Woodland - cleared understorey	150•		
Species List								
Species	**Percent Cover**	**Abundance**	**Native**	**High Threat Exotic**	**Growth Form**	**Summary**	**Total Species**	**Total %**
Eucalyptus crebra	25		N		Tree (TG)	**Tree (TG)**	**3**	**50**
Eucalyptus fibrosa	20		N		Tree (TG)	**Shrub (SG)**	**1**	**3**
Melaleuca decora	5	2	N		Tree (TG)	**Grass & grass like (GG)**	**8**	**19.2**
Olea europea subsp. cuspidata	0.5			HTE		**Forb (FG)**	**3**	**8**
Ligustrum sinense	0.5			HTE		**Fern**	**0**	**0**
Bursaria spinosa	3		N		Shrub (SG)	**Other (OG)**	**1**	**0.1**
Solanum pseudocapsicum							**16**	
Einadia hastata	1		N		Forb (FG)	**HTE**		**6%**
Einadia trigonos	4		N		Forb (FG)			
Einadia nutans subsp. nutans	3		N		Forb (FG)			
Sida rhombifolia								
Lachnagrostis filiformis	1		N		Grass & grasslike (GG)			
Rubus fruticosus	0.5			HTE				
Lomandra multiflora	0.5		N		Grass & grasslike (GG)			
Plantago lanceolata								
Dichelachne micrantha	0.5	1	N		Grass & grasslike (GG)			
Pennisetum clandestinum	2.5			HTE				
Aristida vagans	2		N		Grass & grasslike (GG)			
Ehrharta erecta	1.5			HTE				
Lepidium africanum								
Paspalum dialatatum	0.5			HTE				
Themeda triandra	15		N		Grass & grasslike (GG)			
Lomandra filiformis subsp. Filiformis	2	3	N		Grass & grasslike (GG)			
Glycine clandestina	0.1	1	N		Other (OG)			

Cirsium vulgare								
Avena sp.								
Cyperus gracilis	0.1		N		Grass & grasslike (GG)			
Panicum sp.	0.1		N		Grass & grasslike (GG)			
TOTALS	82.3		16	6				
GF Code	0.1% = 63cm x 63cm; 0.5% = 1.4m x 1.4m; 1% = 2.0m x 2.0m; 5% = 4m x 5m; 25% = 10m x 10m							
Stems, Hollows and Logs								
Trees	**Stems Count**	**Stems with hollows**						
80+ cm	4	1						
50Cm to 79cm	5							
30cm to 49cm	1							
20cm to 29cm	0							
10cm to 19cm	0							
5cm to 9cm	0							
<5cm	2							
Totals								
Length of logs (>10cm diameter and >50cm length)	2							
Percent Covers								
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**			
1	30	1	0	0	31			
2	35	1	0	0	36			
3	20	2	0	0	22			
4	15	1	0	0	16			
5	2	0	0	0	2			
Average	20.4	1	0	0	21.4			

Date	Recorder		Report Plot No.	Location	Zone	Bearing		
08/12/2019	Kurtis Lindsay		BAM3	Stratford House	Derived Native Grassland	240•		
Species	**Percent Cover**	**Abundance**	**Native**	**High Threat Exotic**	**Growth Form**	**Summary**	**Total**	**Total %**
Aristida vagans	20		N		Grass & grasslike (GG)	**Tree (TG)**	0	0
Themeda triandra	50		N		Grass & grasslike (GG)	**Shrub (SG)**	0	0
Lachnagrostis filiformis	1		N		Grass & grasslike (GG)	**Grass & grasslike (GG)**	5	72.5
Vulpia sp.						**Forb (FG)**	0	0
Senecio madagascariensis	0.25			HTE		**Fern**	1	1
Pennisetum clandestinum	1			HTE		**Other (OG)**	0	0
Plantago lanceolatus						**High Threat Exotic**		**3**
Chondrilla juncacea								
Hypochaeris radicata								
Cheilanthes sieberi	1		N		Fern			
Briza maxima								
Romulea rosea	1.75			HTE				
Lomandra confertifolia	1		N		Grass & grasslike (GG)			
Lomandra filiformis	0.5		N		Grass & grasslike (GG)			
Centaurium tenuiflorum								
GF Code	0.1% = 63cm x 63cm; 0.5% = 1.4m x 1.4m; 1% = 2.0m x 2.0m; 5% = 4m x 5m; 25% = 10m x 10m							
Stems, Hollows and Logs								
Trees	**Stems Count**	**Stems with hollows**						
80+ cm	0	0						
50Cm to 79cm	0	0						
30cm to 49cm	0	0						
20cm to 29cm	0	0						
10cm to 19cm	0	0						
5cm to 9cm	0	0						
<5cm	0	0						

Totals	0	0						
Length of logs (>10cm diameter and >50cm length)	0	0						
Percent Covers								
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**			
1	2	0	0	0				
2	1	0	0	0				
3	1	5	0	0				
4	35	0	0	0				
5	2	5	0	0				
Average	8.2	2	0	0				

Date	Recorder		Report Plot No.	Location	Zone	Bearing		
08/12/2019	Kurtis Lindsay		BAM4	Stratford House	Derived Native Grassland	140•		
Species	**Percent Cover**	**Abundance**	**Native**	**High Threat Exotic**	**Growth Form**	**Summary**	**Total**	**Total %**
Aristida vagans	5		N		**Grass & grasslike (GG)**	**Tree (TG)**	**0**	**0**
Themeda triandra	45		N		**Grass & grasslike (GG)**	**Shrub (SG)**	**0**	**0**
Lachnagrostis filiformis	0.2		N		**Grass & grasslike (GG)**	**Grass & grasslike (GG)**	**7**	**53.9**
Vulpia sp.						**Forb (FG)**	**0**	**0**
Senecio madagascariensis	0.5			HTE		**Fern**	**0**	**0**
Pennisetum clandestinum	2			HTE		**Other (OG)**	**0**	**0**
Plantago lanceolatus						**High Threat Exotic**		**3**
Hypericum perforatum	0.5			HTE				
Medicago polymorpha								
Lomandra confertifolia	1		N		**Grass & grasslike (GG)**			
Vulpia sp.								
Cynodon dactylon	2		N		**Grass & grasslike (GG)**			
Cyperus gracilis	0.2		N		**Grass & grasslike (GG)**			
Juncus pauciflorus	0.5		N		**Grass & grasslike (GG)**			
Chondrilla juncacea								
Briza maxima								
Centaurium tenuiflorum								
Stems, Hollows and Logs								
Trees	**Stems Count**	**Stems with hollows**						
80+ cm	0	0						
50Cm to 79cm	0	0						
30cm to 49cm	0	0						
20cm to 29cm	0	0						
10cm to 19cm	0	0						
5cm to 9cm	0	0						

<5cm	0	0						
Totals	0	0						
Length of logs (>10cm diameter and >50cm length)	0	0						
Percent Covers								
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**			
1	10	2	0	0				
2	15	5	0	0				
3	2	3	0	0				
4	5	3	0	0				
5	2	30	0	0				
Average	6.8	8.6	0	0				

Date	Recorder		Report Plot No.	Location	Zone	Bearing		
08/12/2019	Kurtis Lindsay		BAM5	Stratford House	Derived Native Grassland	60•		
Species	**Percent Cover**	**Abundance**	**Native**	**High Threat Exotic**	**Growth Form**	**Summary**	**Total**	**Total %**
Aristida vagans	2		N		Grass & grasslike (GG)	**Tree (TG)**	**0**	**0**
Themeda triandra	85		N		Grass & grasslike (GG)	**Shrub (SG)**	**2**	**0.6**
Rubus fruticosus	0.8			HTE		**Grass & grasslike (GG)**	**4**	**87.2**
Lachnagrostis filiformis	0.1		N		Grass & grasslike (GG)	**Forb (FG)**	**2**	**0.2**
Senecio madagascariensis	0.2			HTE		**Fern**	**1**	**2**
Pennisetum clandestinum	2			HTE		**Other (OG)**	**0**	**0**
Plantago lanceolatus						**High Threat Exotic**	**4**	
Romulea rosea	1			HTE				
Briza maxima								
Gnapthalium sp.								
Cheilanthes sieberi	2		N		Fern			
Hypochaeris radicata								
Chrysocephalum apiculatum	0.1		N		Forb			
Chondrilla juncacea								
Dichelachne micrantha	0.1		N		Grass & grasslike (GG)			
Melaleuca thymifolia	0.1		N		Shrub			
Arthropodium milleflorum	0.1		N		Forb			
Astroloma humifusum	0.5		N		Shrub			
Stems, Hollows and Logs								
Trees	**Stems Count**	**Stems with hollows**						
80+ cm	0	0						
50Cm to 79cm	0	0						
30cm to 49cm	0	0						
20cm to 29cm	0	0						
10cm to 19cm	0	0						

5cm to 9cm	0	0						
<5cm	0	0						
Totals	0	0						
Length of logs (>10cm diameter and >50cm length)	0	0						
Percent Covers								
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**			
1	15	0	0	0				
2	10	0	0	0				
3	25	0	0	0				
4	5	20	0	0				
5	55	1	0	0				
Average	22	4.2	0	0				

Date	Recorder		Report Plot No.	Location	Zone	Bearing	
7 Dec 2019	Kurtis Lindsay		BAM6	Stratford House	Exotic Grass	305•	
Species List							
Species	**Percent Cover**	**Abundance**	**Status**		**Summary**	**Total Species**	**Total %**
Pennisetum clandestinum	30		HTE		**Tree (TG)**	**0**	**0**
Paspalum dialatatum					**Shrub (SG)**	**0**	**0**
Romula rosea	2		HTE		**Grass & grasslike (GG)**	**0**	**0**
Vulpia sp.	50				**Forb (FG)**	**0**	**0**
Conyza sp.					**Fern**	**0**	**0**
Medicago polymorpha					**Other (OG)**	**0**	**0**
Hypochaeris radicata					**HTE**	**2**	**32**
Chondrilla juncacea							
Gnapthalium sp.							
Chenopodium album							
Bromus sp							
Senecio madagascariensis							
GF Code	0.1% = 63cm x 63cm; 0.5% = 1.4m x 1.4m; 1% = 2.0m x 2.0m; 5% = 4m x 5m; 25% = 10m x 10m						
Stems, Hollows and Logs							
Trees	**Stems Count**	**Stems with hollows**					
80+ cm	0	0					
50Cm to 79cm	0						
30cm to 49cm	0						
20cm to 29cm	0						
10cm to 19cm	0						
5cm to 9cm	0						
<5cm	0						
Totals	0						
Length of logs (>10cm diameter and >50cm length)	0						

Percent Covers							
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**		
1	1	2	0	0	3		
2	3	0	0	0	3		
3	5	2	0	0	7		
4	5	5	0	0	10		
5	2	0	0	0	2		
Average	3.2	1.8	0	0	5		

Date	Recorder		Report Plot No.	Location	Zone	Bearing		
08/12/2019	Kurtis Lindsay		BAM7	Stratford House	Woodland with garden/weedy understorey	300•		
Species List								
Species	**Percent Cover**	**Abundance**	**Native**	**High Threat Exotic**	**Growth Form**	**Summary**	**Total Species**	**Total %**
Eucalyptus fibrosa	25		N		Tree	**Tree (TG)**	**5**	**68.5**
Eucalyptus crebra	20		N		Tree	**Shrub (SG)**	**4**	**4.2**
Melaleuca decora	20		N		Tree	**Grass & grasslike (GG)**	**9**	**31.1**
Brachychiton populneum	0.5	1	N		Tree	**Forb (FG)**	**4**	**5.2**
Cupressus sp						**Fern**	**0**	**0**
Ligustrum lucidum	2			HTE		**Other (OG)**	**1**	**0.5**
Ligustrum sinense	2			HTE		**HTE**		**9**
Pyrus sp.								
Acacia implexa	2		N		Shrub			
Photinia sp.								
Cotoneaster sp.	0.5			HTE				
Acacia decurrens	3		N		Tree			
Hedera helix	2			HTE				
Agapanthus praecox								
Jasminum polyanthum								
Dimorpthotheca ecklonis								
Bryophyllum sp.	0.5			HTE				
Kalanchoe sp.								
Draceana sp.								
Agave sp.								
Nandina domestica								
Aloe sp.								
Wisteria sp.								
Pistacia cinensis	0.5			HTE				
Bursaria spinosa	1	12	N		Shrub			
Lonicera japonica	0.5			HTE				

Lomandra multiflora	2	6	N		Grass & Grasslike			
Cryptandra spinescens	1	4	N		Shrub			
Einadia trigonos	2		N		Forb			
Asparagus aethiopicus	0.5			HTE				
Themeda triandra	10		N		Grass & Grasslike			
Einadia hastata	3		N		Forb			
Erharta erecta								
Bromus sp.								
Pennisetum clandestinum								
Aristida vagans	12		N		Grass & Grasslike			
Rhytidosperma sp	3		N		Grass & Grasslike			
Senecio madagascariensis								
Dichelachne micrantha	1		N		Grass & Grasslike			
Eragrostis curvula								
Microlaena stipoides	1		N		Grass & Grasslike			
Pinus patula								
Plantago lanceolata								
Lomandra confertifolia	1	10	N		Grass & Grasslike			
Lomandra glauca	0.1	2	N		Grass & Grasslike			
Lomandra filiformis subsp. Filiformis	1	5	N		Grass & Grasslike			
Passiflora sp	0.5			HTE				
Daviesia ulicifolia	0.2	1	N		Shrub			
Amyema gaudichaudii	0.5	3	N		Other			
Dichondra repens	0.1		N		Forb			
Pomax umbellata	0.1		N		Forb			
Vulpia sp.								
GF Code	0.1% = 63cm x 63cm; 0.5% = 1.4m x 1.4m; 1% = 2.0m x 2.0m; 5% = 4m x 5m; 25% = 10m x 10m							
Stems, Hollows and Logs								
Trees	**Stems Count**	**Stems with hollows**						
80+ cm								
50Cm to 79cm	5							
30cm to 49cm	2							

20cm to 29cm	1							
10cm to 19cm	4							
5cm to 9cm	5							
<5cm	4							
Totals								
Length of logs (>10cm diameter and >50cm length)	8							
Percent Covers								
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**			
1	25	2	0	0				
2	10	5	25	0				
3	95	0	0	0				
4	55	35	0	0				
5	65	2	0	0				
Average	50	8.8	5	0				

Date	Recorder		Report Plot No.	Location	Zone	Bearing		
8 Dec 2019	Kurtis Lindsay		BAM8	Stratford House	Garden	300		
Species List								
Species	**Percent Cover**	**Abundance**	**Native**	**High Threat Exotic**	**Growth Form**	**Summary**	**Total**	**Total %**
Liriodendron tulipifera						**Tree (TG)**	**0**	**0**
Cuppressus sp.						**Shrub (SG)**	**0**	**0**
Camellia sasanqua						**Grass & grasslike (GG)**	**3**	**2.1**
Rhododendron sp						**Forb (FG)**	**1**	**0.1**
Acer japonicum						**Fern**	**0**	**0**
Juniperus sp.						**Other (OG)**	**0**	**0**
Citrus limon						**High Threat Exotic**		**4**
Woodwardia fimbriata								
Ligustrum vulgare								
Gladiolus sp.								
Agapanthus praecox								
Hydrangea sp.								
Viola odorata								
Erhardta erecta	0.5			HTE				
Zantedeschia aethiopica								
Buxus sp.								
Rhapis excelsa								
Cotinus coggygria								
Oxalis sp.								
Conyza sp.								
Stellaria media								
Stenotaphrum secundatum	2			HTE				
Cyperus gracilis	0.1		N		Grass & Grasslike			
Microlaena stipoides	2		N		Grass & Grasslike			
Ficus pumila								
Jasminum polyanthum								
Hedera helix	1			HTE				

Hosta plantaginea								
Syagrus romanzoffiana								
Tradescantia fluminesis	0.5			HTE				
Helleborus sp								
Dichondra repens	0.1				Forb			
Oplismenus aemulus	0.1				Grass & Grasslike			
GF Code	0.1% = 63cm x 63cm; 0.5% = 1.4m x 1.4m; 1% = 2.0m x 2.0m; 5% = 4m x 5m; 25% = 10m x 10m							
Stems, Hollows and Logs								
Trees	**Stems Count**	**Stems with hollows**						
80+ cm	0	0						
50Cm to 79cm	0	0						
30cm to 49cm	0	0						
20cm to 29cm	0	0						
10cm to 19cm	0	0						
5cm to 9cm	0	0						
<5cm	0	0						
Totals	0	0						
Length of logs (>10cm diameter and >50cm length)	0	0						
Percent Covers								
BAM (1m x 1m plots)	**Litter**	**Bare**	**Cryptogram**	**Rock**	**Total**			
1	1	0	0	0				
2	98	0	0	0				
3	99	1	0	0				
4	15	25	0	0				
5	85	0	0	0				
Average	59.6	5.2	0	0				

Appendix D. Biodiversity Credit Reports from Biodiversity Assessment Method Calculator

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00018583/BAAS18059/20/00018584	Proposal Name Stratford House	BAM data last updated * 26/11/2019
Assessor Name	Assessor Number	BAM Data version * 22
Proponent Names	Report Created 23/01/2020	BAM Case Status Open
Assessment Revision 0	Assessment Type Part 4 Developments (General)	Date Finalised To be finalised

* 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
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Critically Endangered Ecological Community	1395-Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion

Species
Chalinolobus dwyeri / Large-eared Pied Bat
Chalinolobus dwyeri / Large-eared Pied Bat

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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	Number of credits to be retired
1395-Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	11.4	146.00

1395-Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region
	Shale Sandstone Transition Forest in the Sydney Basin Bioregion This includes PCT's: 792, 1281, 1395	-	Yes	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

BAM Biodiversity Credit Report (Like for like)

Species	Area	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	4.4	174.00
Myotis macropus / Southern Myotis	4.4	116.00

Chalinolobus dwyeri/ Large-eared Pied Bat	1395_Class1_RemnantWeedy	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Chalinolobus dwyeri/Large-eared Pied Bat	Any in NSW
	1395_Class2_CanopyUndersc	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Chalinolobus dwyeri/Large-eared Pied Bat	Any in NSW
Myotis macropus/ Southern Myotis	1395_Class1_RemnantWeedy	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Myotis macropus/Southern Myotis	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018583/BAAS18059/20/00018584	Stratford House	26/11/2019
Assessor Name	Assessor Number	BAM Data version *
		22
Proponent Name(s)	Report Created	BAM Case Status
	23/01/2020	Open
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (General)	To be finalised

* 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
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Critically Endangered Ecological Community	1395-Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion

Species
Chalinolobus dwyeri / Large-eared Pied Bat
Chalinolobus dwyeri / Large-eared Pied Bat

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

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	Number of credits to be retired
1395-Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	11.4	146.00

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

Like-for-like credit retirement options

Name of offset trading group	Trading group	HBT	IBRA region
Shale Sandstone Transition Forest in the Sydney Basin Bioregion This includes PCT's: 792, 1281, 1395	-	Yes	Cumberland,Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

BAM Biodiversity Credit Report (Variations)

Species	Area	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	4.4	174.00
Myotis macropus / Southern Myotis	4.4	116.00

Chalinolobus dwyeri/ Large-eared Pied Bat	1395_Class1_RemnantWeedy	**Like-for-like options**		
		Spp	IBRA region	
		Chalinolobus dwyeri/Large-eared Pied Bat	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
		Fauna	Vulnerable	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.
	1395_Class2_CanopyUndersc	**Like-for-like options**		
		Spp	IBRA region	
		Chalinolobus dwyeri/Large-eared Pied Bat	Any in NSW	
		Variation options		

		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
		Fauna	Vulnerable	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.
Myotis macropus/ Southern Myotis	1395_Class1_RemnantWeedy	**Like-for-like options**		
		Spp	IBRA region	
		Myotis macropus/Southern Myotis	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
		Fauna	Vulnerable	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.

Myotis macropus/ Southern Myotis	1395_Class2_Canopy Undersc	**Like-for-like options**		
		Spp	IBRA region	
		Myotis macropus/Southern Myotis	Any in NSW	
		Variation options		
		Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
		Fauna	Vulnerable	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.

Myotis macropus/ Southern Myotis	1395_Class1_RemnantWeedy	
	1395_Class2_CanopyUndersc	**Like-for-like credit retirement options**

Spp	IBRA region
Myotis macropus/Southern Myotis	Any in NSW

Appendix E. Species Polygons for Threatened species assumed present within the Subject Land

0 20 40 80 120 160 200 Meters

Species Polygon for Large-eared Pied Bat & Southern Myotis

Subject

Waterbodies (Dams)

200m Buffer Around Waterbodies

Land Eco consulting

Date: 23/01/2020
Coordinate System: GDA 1994 MGA Zone 56
Imagery: ESRI

This map was produced for this report only.
It is indicative, not survey-accurate.
It should not be used for design
or construction purposes.

Land Eco consulting

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