

Biodiversity Development Assessment Report

Tallowood Stage 2 - Seniors Living

By Ecological Consultants Australia Pty Ltd TA

Kingfisher Urban Ecology and Wetlands

Updated April 2022



About this document

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Statement of Authorship

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Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position.

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Executive Summary

Introduction

Ecological Consultants Australia (ECA) has been contracted by Environa to provide a **Biodiversity Development Assessment Report** for a proposal at 21 Vincents Road, Kurrajong NSW 2758 within the Hawkesbury City Council Local Government Area (LGA).

Trigger for a formal BDAR under the BC Act 2016:

The proposal triggers the area clearing threshold as per the BOS entry requirements as the impact area exceeds the clearing area threshold.

Stage 1: Biodiversity Assessment

- On-ground survey took place in June and July 2020 by Senior Ecologist Geraldene Dalby-Ball.
- Data was gathered across the entire site and BAM plots recorded throughout.
- The BAM plot data used in the BAM-C is appropriate for the vegetation zone.
- Flora and fauna observations were recorded on-site using binoculars and physical examination. Notes, photos and samples of flora species were taken to assess ecological health and value of the site.
- Bionet searches were performed for flora, fauna and endangered populations to identify if there were previous records of threatened species occurring within the local area using a 10km radius around the site.

Results

Stage 2: Impact Assessment

- The impact calculations were made based on there being direct impacts to vegetation from the proposed development. The impact area and/or areas of modification has been calculated as 0.98 ha within the 5.9ha site.
- Survey plot was within a vegetation community identified as Sydney Turpentine-Ironbark Forest (STIF) (PCT1281).
- STIF is listed as an Endangered Ecological Community (EEC) under the NSW BC Act (2016) and Critically Endangered Ecological Community (CEEC) under the Commonwealth EPBC Act (1999).
- Vegetation onsite has been significantly altered such that the site does not reflect the natural structural attributes of the STIF.
- Vegetation is structurally and functionally poor due to previous clearing onsite. Thus, the proposed development assessed in this BDAR is not expected to significantly contribute to loss of STIF.
- The site has a significant proportion of planted vegetation.
- No threatened species were recorded during the site surveys.

Stage 3: Improving Biodiversity values

- Fauna refuge zone
- Delineation of work areas

- Vegetation clearing control measures
- Weed Management and removal
- Native seed collection
- Preservation of habitat
- Nest boxes
- Native species landscaping

See recommendations section for a detailed explanation as to how these recommendations improve biodiversity values.

Conclusions and Recommendations

- The proposed development will have an approximate impact area of 0.98 ha on Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). This vegetation has been significantly altered and degraded from its natural state.
- The site has been managed for agricultural and horticultural purposes (stone fruit orchards) since the 1800's. The site has a long history of vegetation clearing, habitat fragmentation and on-going disturbance, via agricultural practices. A majority of vegetation on site is regrowth or has been planted by the property owner. There are areas of potential remnant vegetation left on the property, however the majority of the site has been cleared.
- The total cost to offset both ecosystem credits and species credits generated by this development is \$149,878.09 (including GST), assuming payment will be made into the Biodiversity Conservation Fund.
- Mitigation measures including but not limited to; nest boxes, native species landscaping, delineation of works zones, weed removal, tree protection and fauna refuge zones should all be used to mitigate any impacts associated with the proposal and increase habitat opportunities in the area.

Table of Contents

| | |
|---|-----------|
| About this document | i |
| Executive Summary | ii |
| Stage 1: Biodiversity Assessment | 1 |
| 1 Introduction | 1 |
| 1.1 Site information and general description..... | 1 |
| 1.2 Site history..... | 3 |
| 1.3 Proposed actions..... | 4 |
| 1.4 Sources of information used in the assessment | 6 |
| 1.5 Legislative context and statutory requirements..... | 6 |
| 1.5.1 NSW Biodiversity Conservation Act 2016 and associated documents | 6 |
| 1.5.2 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999..... | 7 |
| 1.5.3 State Environmental Planning Policy (Koala Habitat Protection) 2020 | 7 |
| 1.5.4 Hawkesbury Local Environmental Plan 2012 | 9 |
| 1.6 Biodiversity Offsets Scheme threshold | 10 |
| 1.6.1 BOS Area Clearing Threshold..... | 10 |
| 1.6.2 Biodiversity Values Map | 11 |
| 2 Landscape features..... | 13 |
| 3 Native vegetation | 17 |
| 3.1 Desktop results – Plant Community Types (PCTs) and Vegetation Zones..... | 17 |
| 3.2 Field Survey – PCTs and Vegetation Zones | 19 |
| 3.2.1 Field Survey and PCT Justification | 20 |
| Vegetation Zone 2..... | 20 |
| 3.2.2 Planted Native Vegetation on site..... | 20 |
| 3.2.3 Site Photos..... | 24 |
| 4 Threatened Species | 26 |
| 4.1 Flora and Fauna Field Survey | 26 |
| 4.1.1 Opportunistic Flora and Fauna survey methods | 26 |
| 4.1.2 Diurnal Bird Surveys | 26 |
| 4.1.3 Microbats | 27 |
| 4.1.4 Mammal Surveys | 27 |
| 4.1.5 Amphibian Surveys | 27 |
| 4.1.6 Reptile and Snail surveys | 27 |
| 4.1.7 Koala assessment summary | 28 |
| 4.1.7.1 Survey effort..... | 28 |
| 4.1.7.2 Analysis of potential impacts..... | 28 |
| 4.1.7.3 Mitigation measures..... | 29 |
| 4.1.7.4 Conclusion | 29 |
| 4.2 Threatened Flora - Desktop..... | 30 |
| 4.3 Threatened Fauna - Desktop..... | 30 |
| Stage 2: Impact Assessment | 34 |

| | | |
|-----------|---|-----------|
| 5 | BAM Calculator | 34 |
| 5.1 | Vegetation Zones and Integrity Scores | 34 |
| 5.2 | Species and Ecosystem Credits | 36 |
| 5.2.1 | Ecosystem Credit Species derived from BAM..... | 37 |
| 5.2.2 | Species Credit Species derived from BAM..... | 38 |
| 6 | Direct Impacts | 39 |
| 6.1.1 | Vegetation disturbance and Loss | 40 |
| 7 | Indirect Impacts | 40 |
| 7.1.1 | Weed growth and invasion..... | 40 |
| 7.1.2 | Introduction of pathogens..... | 40 |
| 7.1.3 | Soil disturbance and erosion | 40 |
| 7.1.4 | Water Quality | 41 |
| 8 | Serious and Irreversible Impact Assessment (SAII)..... | 41 |
| 8.1.1 | Step one - Identify relevant entities at risk of a SAII | 41 |
| 8.1.2 | Step two - Evaluate the extinction risk of the entity to be impacted..... | 42 |
| 8.1.3 | Step three - Detail measures taken to avoid, minimise and mitigate impacts on the entity | 43 |
| 8.1.4 | Step four - Evaluate a serious and irreversible impact..... | 44 |
| | Stage 3: Improving Biodiversity Values | 45 |
| 9 | Avoid and minimise impacts..... | 45 |
| 9.1 | Prescribed impacts..... | 45 |
| 9.2 | Avoid and Minimise Impacts | 46 |
| 10 | Recommendations | 47 |
| 10.1.1 | Wildlife corridor/ Revegetation..... | 47 |
| 10.1.2 | Asset Protection Zone Management..... | 48 |
| 10.1.3 | Weed management..... | 49 |
| 10.1.4 | Delineation of work areas | 49 |
| 10.1.5 | Vegetation clearing control measures..... | 49 |
| 10.1.6 | Tree Protection..... | 49 |
| 10.1.7 | Weed Removal Techniques | 50 |
| 10.1.8 | Native Seed Collection..... | 50 |
| 10.1.9 | Nest boxes | 50 |
| 10.1.10 | Pathogen prevention..... | 50 |
| 11 | Conclusions | 51 |
| 12 | Appendices | 52 |
| 12.1 | Appendix I – Rationale for Likelihood of Occurrence | 52 |
| 12.2 | Appendix II– Key Weed Removal Methods | 64 |
| 12.3 | Appendix III– Bushland Hygiene Protocols for Phytophthora (Hornsby Council Recommendations) | 68 |
| 12.4 | Appendix IV– BAM –C; Reports and Data | 70 |
| 12.5 | Appendix VI – Species Polygon | 82 |
| 12.6 | Appendix VII – BAM Plot Field | 84 |
| 13 | Expertise of authors | 87 |

Stage 1: Biodiversity Assessment

1 Introduction

Ecological Consultants Australia (ECA) has been contracted by Environa to provide a **Biodiversity Development Assessment Report** for a proposal at 21 Vincents Road, Kurrajong NSW 2758 within the Hawkesbury City Council Local Government Area (LGA).

1.1 Site information and general description

The development site (the “Site”) is the area of direct and likely indirect impacts and is defined as the whole of the property. The subject land is located within the western portion of the site and consists of the construction and operational footprint of the proposed development.

This area has been assessed in the Biodiversity Assessment Method Calculator (BAM-C) from which offset credits have been generated.

Geraldene Dalby-Ball undertook to site based investigation for this BDAR.

Table 1.1 - Site Administrative Information

| Category | Details |
|--------------------------|---|
| Title Reference (Lot/DP) | 6/-/DP270827 |
| Site Area | 5.9Ha |
| Street Address | 21 Vincents Road, Kurrajong NSW 2758 |
| LGA | Hawkesbury City Council |
| Land Zoning | RU1: Primary Production and SP2 Special infrastructure. |



Figure 1.1 - Lot/site Boundary at 21 Vincents Road, Kurrajong NSW 2758. Source of aerial SixMaps 2020



Figure 1.2a – Construction/Operational footprint of the proposed development. 21 Vincents Road, Kurrajong NSW 2758. Source of aerial SixMaps 2020

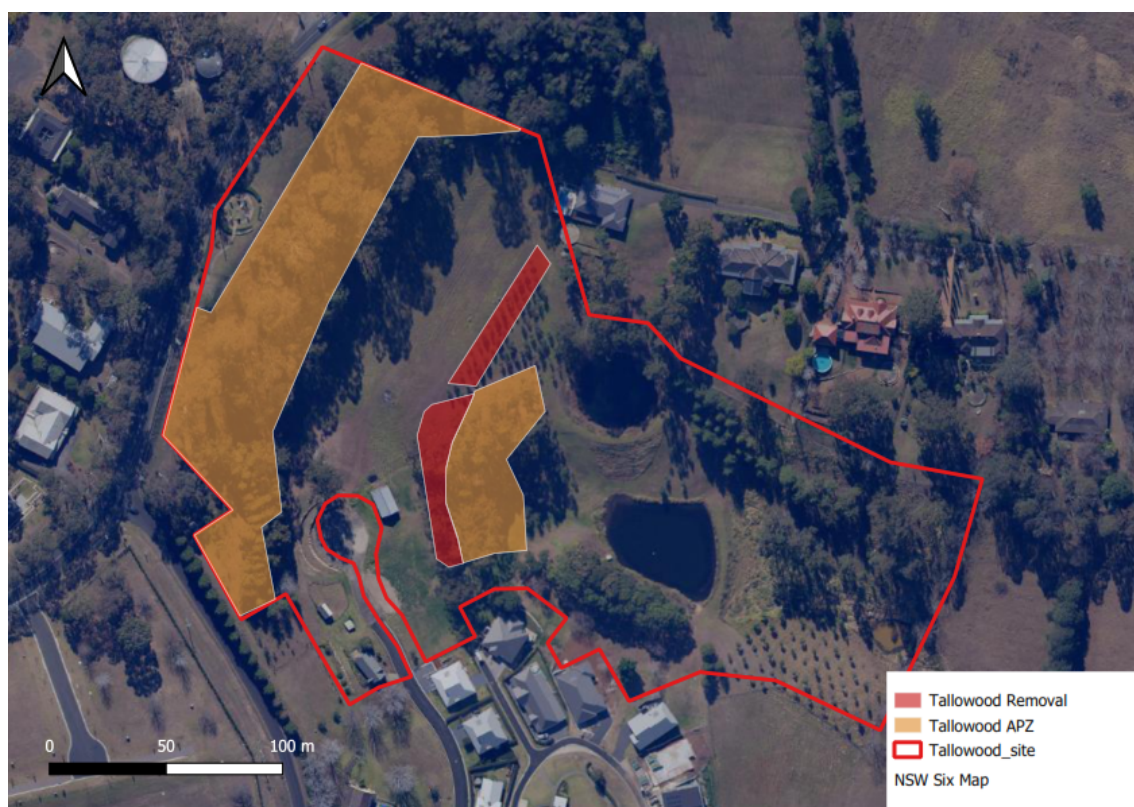


Figure 1.2b - Subject land of the proposed development/ vegetation requiring modification to facilitate APZ requirements. Source of aerial SixMaps 2021.

**Construction footprint includes the adjoining property at 7 Vincents Rd, (Lot 300/DP 1184237). This lot is required to facilitate construction access to the site. The existing dwelling is proposed to be demolished. Operational footprint includes area of the site required to be managed as APZ. This includes areas of cleared managed land adjacent to the private cemetery and mixed vegetation outside of the construction footprint.*

1.2 Site history

The site has been managed for agricultural and horticultural purposes (stone fruit orchards) since the 1800's. Native vegetation would have once covered the area although due to modification and disturbance, the site has lost many natural attributes. The site has been significantly altered and degraded from its natural state due to a long history of vegetation clearing, habitat fragmentation and on-going disturbance, via agricultural practices.

A majority of vegetation on site is regrowth or has been planted by the property owner. Patches of potential remnant vegetation is located on the property. Exotic species are dominant across the site and are preventing the recruitment of the original vegetation community.

1.3 Proposed actions

The proposal for Tallowood Stage 2 seniors living includes: 18 x villas including a mix of 2, 3 and 4 bedroom units. The proposal also includes community parklands, community barn/workshed and a private cemetery/columbarium.



Figure 1.3 - Site Plan and construction footprint for the proposal at 21 Vincents Road, Kurrajong NSW 2758. Source – envrona studio 3/09/20 Issue N.



Figure 1.4 - Landscape Plan for the proposal at 21 Vincents Road, Kurrajong NSW 2758. Source – environa studio/JLA 05/02/21 Issue E

1.4 Sources of information used in the assessment

The following sources of information were used for this assessment:

- SeedMaps DPIE 2020
- CumberlandPlainWest_VIS__4207 OEH (2016)
- BioNet DPIE (2020)
- Planning for Bush Fire Protection (PBP) NSW RFS 2019.
- 21 Vincents Road, Kurrajong, Site Plan + Locality Plan. Environa Studio 2020. Issue N
- Landscape Master Plan. Environa Studio and John Lock & Associates Landscape Architecture. 5/2/21 Issue E
- Plan showing Levels & Contours over part of 21 Vincents Road, Kurrajong. McKinlay Morgan & Associates Pty Ltd 2020
- Tree Impact Assessment Report. Mark Bury Consulting. 3rd December 2020.
- Bushfire Assessment Report Seniors Living Development. Building Code & Bushfire Hazard Solutions Pty Limited. 31st July 2020.
- Flora and Fauna Survey Effort & Results. Travers Bushfire & Ecology. 28/05/2020
- Fire and Vegetation Management Plan Tallowood Stage 2 - Seniors Living – Kingfisher, February 2021.

1.5 Legislative context and statutory requirements

1.5.1 NSW Biodiversity Conservation Act 2016 and associated documents

The *Biodiversity Conservation Act 2016* (BC Act 2016) is the key legislation that enables the conservation of biodiversity within the state of New South Wales. The BC Act 2016 facilitates the assessment and on-going protection of flora and fauna, including threatened species and ecological communities. The BC Act 2016 outlines assessment and offsetting requirements for activities with the potential to impact on threatened species and ecological communities in NSW, and the clearing of native vegetation which exceeds the threshold.

The BC Act also:

- Outlines the licences required under the BC Act to harm protected flora and fauna;
- Lists Threatened species and ecological communities in Schedules 1 and 2;
- Sets out monetary and imprisonment penalties for offences relating to the harming of protected flora and fauna;
- Under Part 7 (s7.4), introduces a list of activities/proposal that exceeds the biodiversity offsets scheme threshold.

The NSW *Biodiversity Conservation Regulation 2017* sets out the Biodiversity Offsets Scheme entry threshold for Part 4 developments under the EP&A Act 1979. If the development triggers as least one (1)

entry threshold, the development must be assessment under The BC Act using the Biodiversity Assessment Method (BAM) (OEH 2017). See also <https://www.environment.nsw.gov.au/biodiversity/entryrequirements.htm>

1.5.2 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is applicable if it was considered that an impact on a 'matter of National Environmental Significance (NES)' were likely, thus providing a trigger for referral of the proposal to the Department of Environment and Heritage.

Matters of national environmental significance identified in the Act are:

- world heritage properties;
- national heritage places;
- Ramsar wetlands;
- nationally threatened species and communities;
- migratory species protected under international agreements;
- the Commonwealth marine environment; and
- nuclear actions.

The Commonwealth Government has published Significant Impact Guidelines (DE 2013) to assist in the determination of whether an action is likely to have a significant impact on a matter of NES. The proposal is not expected to significantly impact any MNES

1.5.3 State Environmental Planning Policy (Koala Habitat Protection) 2021

The principles of the Koala SEPP 2021 are to:

- Help reverse the decline of koala populations by ensuring koala habitat is properly considered during the development assessment process.
- Provide a process for councils to strategically manage koala habitat through the development of koala plans of management.

As per SEPP 2021 the proposed activity comes under Part 2 Point 11.

This is because there is currently no Approved Koala Plan of Management for Hawksbury City Council area.

Part 2 Development control of koala habitats

10 Development assessment process—approved koala plan of management for land

- (1) This clause applies to land to which this Policy applies and to which an approved koala plan of management applies.
- (2) The council's determination of the development application must be consistent with the approved koala plan of management that applies to the land.

11 Development assessment process—no approved koala plan of management for land

- (1) This clause applies to land to which this Policy applies if the land—
 - (a) has an area of at least 1 hectare (including adjoining land within the same ownership), and
 - (b) does not have an approved koala plan of management applying to the land.
- (2) Before a council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on koalas or koala habitat.
- (3) If the council is satisfied that the development is likely to have low or no impact on koalas or koala habitat, the council may grant consent to the development application.
- (4) If the council is satisfied that the development is likely to have a higher level of impact on koalas or koala habitat, the council must, in deciding whether to grant consent to the development application, take into account a koala assessment report for the development.
- (5) However, despite subclauses (3) and (4), the council may grant development consent if the applicant provides to the council—
 - (a) information, prepared by a suitably qualified and experienced person, the council is satisfied demonstrates that the land subject of the development application—
 - (i) does not include any trees belonging to the koala use tree species listed in Schedule 2 for the relevant koala management area, or
 - (ii) is not core koala habitat, or
 - (b) information the council is satisfied demonstrates that the land subject of the development application—
 - (i) does not include any trees with a diameter at breast height over bark of more than 10 centimetres, or
 - (ii) includes only horticultural or agricultural plantations.
- (6) In this clause—
koala assessment report, for development, means a report prepared by a suitably qualified and experienced person about the likely and potential impacts of the development on koalas or koala habitat and the proposed management of those impacts.

Clause 11 – considerations

With regard to clause 11 (1):

- a. The proposed land is over 1 ha when taking in to consideration land ownership of adjoining land.

Yes the proposed land is greater than 1 ha.

- b. Does not have an approved Koala Management Plan

There is currently no Approved Koala Plan of Management for Hawksbury City Council.

Clause 11 (2)

This ecological report provides information for Council to assess the impact on Koalas. This report indicated that for this location Tallowood Stage 2, the removal of the approximately 0.2ha of planted native trees and the modification of approximately 0.98ha of STIF canopy to facilitate APZ requirements in accordance with Planning for Bush Fire Protection that are not expected to directly impact Koalas. They do make up loss of KUTs though.

Clause 11(3)

Given the above it is considered that Council can approve the proposed activity.

Clause 11 (4)

As the impact has been shown, in this report, to be low/no impact it is considered that Council can approve the proposed activity.

Clause 11 (5)

(5a) i) The site has trees listed on Schedule 2.

(5a) ii) The site is within an area mapped as core habitat although this urban area is transition out of the core area. The site itself would not fulfill the definition or objective of Core habitat (in its current state).

(5b) i) The site does have trees with BDH over 10cm. However trees proposed for removal are less than 10cm in diameter (see figure 3.8). Trees with a diameter greater than 10cm will be modified within the APZ as per bushfire requirements.

(5b) ii) The site is not only horticultural species

Native species being removed are one *E. teriticornis* and one *Eucalyptus paniculata*.

In summary for Clause 5. Council can approved the proposed activity as while there are isolated trees within the site that are native and over 10cm DBH those being removed do not result in isolating other trees more than they already are.

The trees proposed to be removed are known Koala Use Trees at this location.

See section 4.1.7 below for details on the koala assessment for this proposal.

1.5.4 Hawkesbury Local Environmental Plan 2012

The site is identified as “Significant vegetation” and “Connectivity between significant vegetation” on the Terrestrial Biodiversity Map as published by Hawkesbury City Council. (Map Identification Number: 3800_COM_BIO_004_080_20120314).

As identified in HLEP (2012) the aim of part 6, clause 6.4 is to maintain terrestrial biodiversity by—

- (a) protecting native fauna and flora, and
- (b) protecting the ecological processes necessary for their continued existence, and
- (c) encouraging the conservation and recovery of native fauna and flora and their habitats.

The proposal will include revegetation areas and biodiversity strategies which will satisfy and contribute to the objectives of part 6, clause 6.4 in the HLEP. Mitigation measures are outlined in section 10 of this report.



Figure 1.5 - The site is situated on “Significant vegetation” and “Connectivity between significant vegetation” on the Terrestrial Biodiversity Map as published by Hawkesbury City Council.

1.6 Biodiversity Offsets Scheme threshold

The Biodiversity Offsets Scheme applies to:

local development (assessed under Part 4 of the Environmental Planning and Assessment Act 1979) that triggers the Biodiversity Offsets Scheme threshold (see section 1.6) or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the Biodiversity Conservation Act 2016.

1.6.1 BOS Area Clearing Threshold

The proposal triggers the area clearing threshold as per the BOS entry requirements as the impact area exceeds the clearing area threshold. Area clearing thresholds are determined by minimum lot size and guidelines outlined in BAM (OEH 2017) (Figure 1.4).

Table 1.2. Minimum lot size and threshold which the development exceeds.

| | |
|--|--------|
| Minimum lot size | 10Ha |
| Threshold for clearing, above which the BAM and offsets scheme apply | 0.5ha |
| Impact area | 0.96ha |

Area clearing threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

| 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 |

Figure 1.6 - The area clearing threshold as per the BOS entry requirements.

1.6.2 Biodiversity Values Map

Multiple areas of the site are identified on the Biodiversity Values map published by the Chief Executive of the NSW Office of Environment and Heritage. The development is isolated to the western portion of the site. The purple shaded area on the eastern side of the site is outside of the proposed operational footprint will not be directly impacted.



Figure 1.7 - Biodiversity Map – Development Site in red. Source:

<https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap>

Assessment Type

The assessment type used in the BAM-C is Part 4 Developments (Small Area) Appendix C – BAM (2020). Appendix C in Biodiversity Assessment Method (BAM) 2020 was used to guide information included in this assessment. Proposed actions do not exceed the maximum area limit for application of the small area development module (Table 12 BAM), therefore the proposal is eligible to be assessed as per the *Streamlined Assessment Module – Small Area* (BAM, 2020).

Appendix C: Streamlined assessment module – Small area

This section sets out a streamlined assessment module for assessing:

- the biodiversity values of a small area development (Stage 1), including a proposed activity or clearing
- the impacts of the development on biodiversity
- an offset requirement for the impact.

The assessor can use the streamlined assessment module for small area development in the BAM-C.

The streamlined assessment module for small area developments must only be used according to the area clearing threshold shown in Table 12. Even though these are small areas of impact, the assessor must still apply the hierarchy of avoiding and minimising impacts on biodiversity before considering offsetting residual impacts.

The streamlined assessment module for small area developments may be used to assess the biodiversity values of land that is located within an area on the Biodiversity Values Map, except where the biodiversity value included on the Biodiversity Values Map is core koala habitat identified in a plan of management under the *State Environmental Planning Policy (Koala Habitat Protection) 2019*.

The small area assessment is applied in accordance with Table 13.

Table 12 Area clearing limits for application of the small area development module


| Minimum lot size associated with the property * | Maximum area clearing limit for application of the small area development module |
|--|--|
| Less than 1 ha | ≤1 ha |
| Less than 40 ha but not less than 1 ha | ≤2 ha |
| Less than 1000 ha but not less than 40 ha | ≤3 ha |
| 1000 ha or more | ≤5 ha |
| *shown in the lot size maps made under the relevant local environmental plan (LEP), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP) | |

Figure 1.8 - Entry requirements for proposals under the BAM 2020 Streamlined assessments module –Small Area

2 Landscape features

The site is located within agricultural/rural/light industrial setting. The surrounding properties are made up of agricultural (Cropping) rural (grazing and pasture paddocks) and patches of native bushland.

Table 2.1 - Site Biodiversity Information

| Category | Details |
|--|---|
| Interim Biogeographic Regionalisation for Australia (IBRA) | Sydney Basin |
| IBRA Sub Region | Cumberland |
| NSW Landscape | Cumberland Plain Cpl - Below  <div data-bbox="906 728 1465 967"> <p>Mitchell Landscapes v3.1 - Ecosystem Meso Grouping</p> <p>Ecosystem Meso Grouping: SB Cumberland</p> <p>Landscape Code: Cpl</p> <p>Landscape Name: Cumberland Plain</p> <p>Over Cleared Status: Over-cleared</p> <p>Estimate Fraction Cleared: 0.89</p> </div> |
| % Native vegetation cover | 25% in the 1500m radius circle See Figure 2.1 |
| Landscape features | |
| Rivers and streams | <p>Site features two existing dams. No waterways are present on site. The drainage lines between the existing dams do not host aquatic/semi-aquatic vegetation and have poorly defined banks.</p> <p>These spill-way flow paths are covered in exotic grass species and have been formed as a result of previous (historical) site modifications.</p> <p>Rivers and streams are present within the assessment area. Downhill from the site, several spillways of larger dams connect to eventually create first order streams within the assessment area. These streams are likely to flow seasonally before reaching the first perennial stream at Redbank Creek. This creek is within the greater Hawkesbury River Catchment.</p> |

| | |
|---|---|
| Wetlands | <p>No wetlands are present within the site or lots adjacent to the site.</p> <p>No wetlands are located within the assessment area.</p> |
| Connectivity features | <p>Vegetation within the site is connected to adjoining bushland via paddock trees and inconsistent structural layers. This is the same for connectivity throughout the majority of private land in the assessment area. Greater connectivity within the assessment area exists along riparian corridors.</p> |
| Areas of geological significance and soil hazard features | <p>Site does not contain karst, caves, cliffs or areas considered to be geologically significant.</p> |
| Areas of Outstanding Biodiversity Value identified under the BC Act | <p>There are currently no areas of outstanding biodiversity that occur within the site or assessment area.</p> |
| Geology and Soil | <p>“Luddenham” is the identified soil landscape for the site as per eSpade2.0 (DPIE, 2020).</p> <p>Luddenham is characterised by Hills and low hills on Wianamatta Group Bringelly Shale (shale, sandstone-lithic and siltstone/mudstone) in the Cumberland Plain and Blue Mountains Plateau.</p> |



Figure 2.1 - Assessment Area Map. Red circle showing the 1500m buffer around the site.

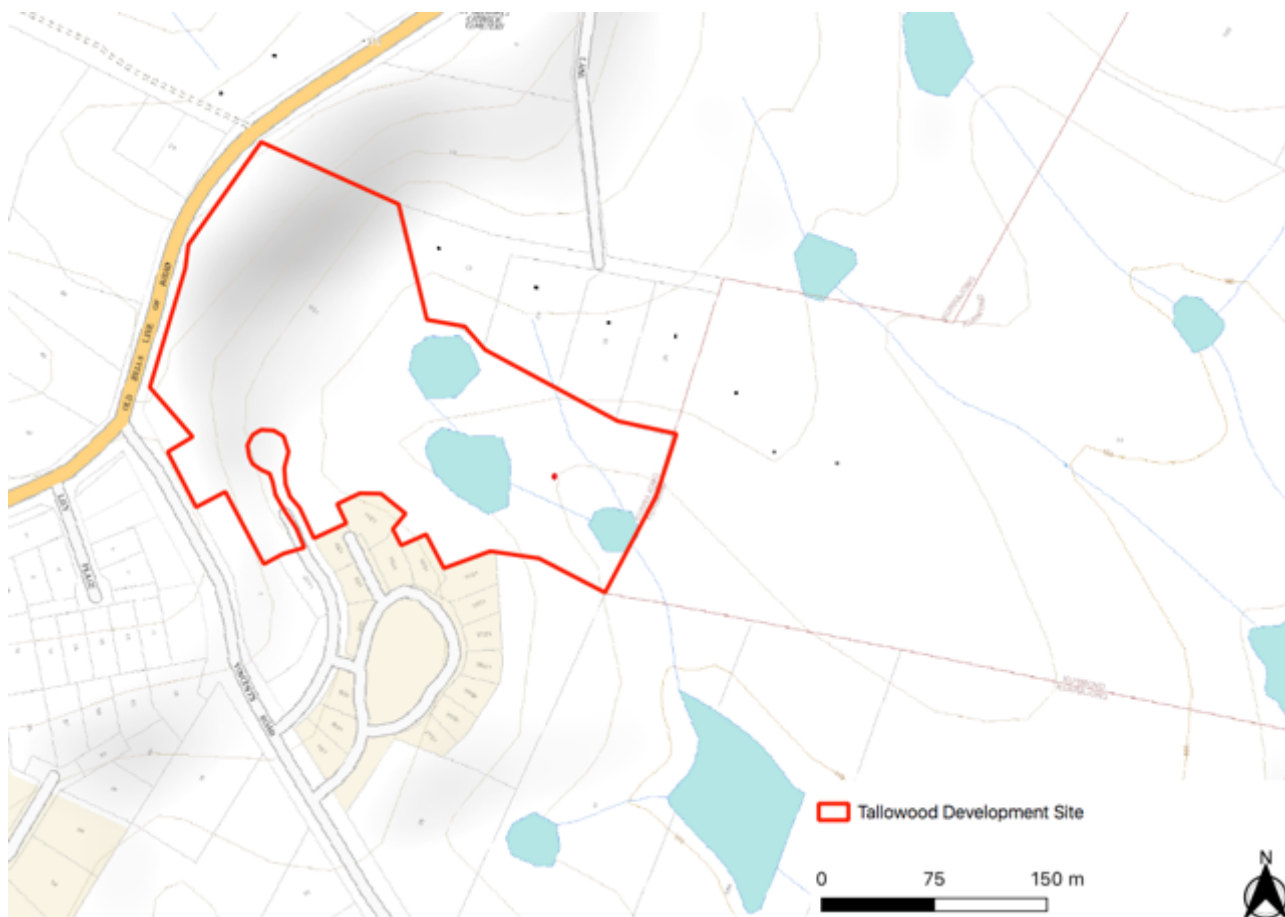


Figure 2.2 - Topographic map of the development site and immediate surrounds. Base map: Six maps - https://maps.six.nsw.gov.au/arcgis/rest/services/public/NSW_Topo_Map/MapServer



Figure 2.3 - Soil Landscapes mapping via SEED Soil Landscapes of Central and Eastern NSW.

3 Native vegetation

3.1 Desktop results – Plant Community Types (PCTs) and Vegetation Zones

A review of the most up-to-date vegetation mapping, CumberlandPlainWest_VIS__4207 DPIE (2020), identified two plant community types (PCT) within site. These were verified on site as best as possible given the fragmented and disturbed condition. The PCT are identified in Table 3.1

Table 3.1 – Table of vegetation community synonyms as per NSW and Commonwealth legislation.

| NSW PCT Code | NSW PCT Name | BC Act 2016 | EPBC Act 1999 |
|--------------|--|--|--|
| 1281 | Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion | Sydney Turpentine-Ironbark Forest State Conservation: Endangered Ecological Community (EEC) | Sydney Turpentine-Ironbark Forest Commonwealth Conservation: Critically Endangered (CE) |
| 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 State Conservation: Critically Endangered Ecological Community (CEEC) | Shale Sandstone Transition Forest in the Sydney Basin Bioregion Commonwealth Conservation: Critically Endangered (CE) |

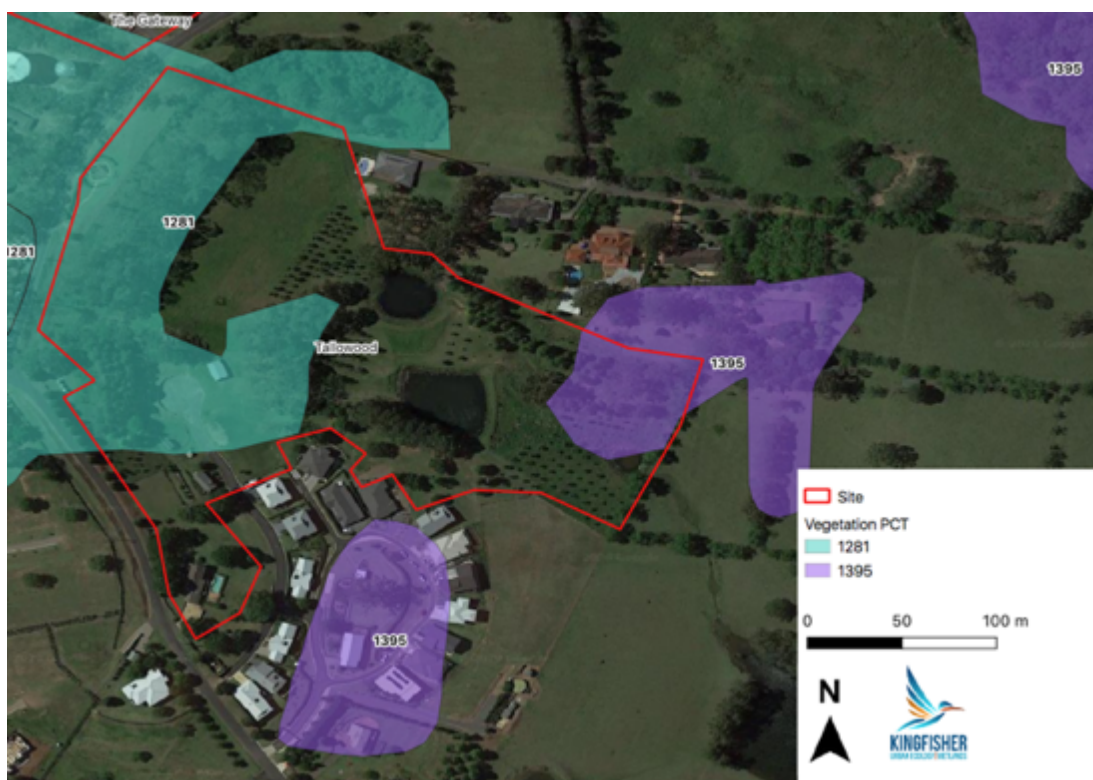


Figure 3.1 - Subject site within mapped remnant vegetation surrounding the property. Source: Kingfisher, 2020.



Figure 3.2 - Historical Imagery of the site taken 29/03/1978. NSW Spatial Portal, 2021.



Figure 3.3 - Historical Imagery of the site taken 1986. NSW Spatial Portal, 2021.

3.2 Field Survey – PCTs and Vegetation Zones

Figure 3.4 shows the Vegetation Mapping and Zones identified during field survey



Figure 3.4 - Vegetation Mapping and Zones identified during field survey

3.2.1 Field Survey and PCT Justification

The field survey revealed a highly-disturbed site. Historical clearing, agricultural and other management practices have resulted in a site with little to no resemblance of the original plant community that would have once covered this area. Currently the site is dominated by exotic pasture grasses with patches of planted and native canopy species.

Vegetation Zone 1

Initial assessment concluded that the vegetation which runs adjacent to Old Bells Line of Road appears to have the highest vegetation integrity. This zone is in marginal condition with a high abundance of exotic vegetation scattered throughout. Possibly remnant, *E. tereticornis* are present on the road verge with Old Bells Line of Road. Historical imagery available through NSW spatial portal reveals majority of the site has been previously cleared (see figures 3.2/3.3), however the vegetation along Old Bells Road at the western portion of the site appears to have persisted since at least 1975 and may form part of the original vegetation community. Sections of this vegetation zone has been planted by the landowner.

The combination of historical plantings and poor species composition hinder the ability to differentiate between a number of PCTs that could occur within this patch such as PCT 792 and PCT 1395. Therefore, this vegetation has been assessed as Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion (PCT1281) in the BAM-C. This finding was concluded following desktop investigations and field plot-based assessments and the experience of the assessing ecologist with vegetation in this area of NSW. This patch of vegetation is highly disturbed, assessment of the associated TEC (STIF) is similarly hindered by the lack of native vegetation and previous site disturbances. As a result, a precautionary approach was taken and assumed that if managed correctly the seedbank of the original PCT would likely exist and vegetation was assessed as Sydney Turpentine-Iron Bark Forest (STIF) TEC, in the BAM -C, albeit in poor condition.

Vegetation Zone 2

This vegetation is located within the eastern portion of the operational footprint of the site. The survey revealed a semi-mature canopy of native species planted after 1986. These plantings are evenly spaced and in a linear pattern. No discernible native mid or ground stratum are present. Exotic weed species are dominant across this vegetation zone. Current management practices are inhibiting natural recruitment of the surrounding native individuals. Historical imagery in figure 3.2 reveal this area was managed as agricultural land. Due to the extent of disturbance associated with these practices such as grazing, herbicide use, soil movement it is unlikely the seed bank of the original plant community is still viable if present at all.

3.2.2 Planted Native Vegetation on site

CumberlandPlainWest_VIS__4207 DPIE (2020) (Figure 3.1) depicts a partial section of this vegetation to consist of Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (PCT1281). This area has been disturbed and trees replanted by the property owners. The canopy over across the site is discontinuous. The mid stratum is primarily absent within site boundaries. The ground stratum has been highly disturbed, with much of the site dominated by 'High Threat Exotic' (HTE) species. The majority of the site is currently being maintained as pasture grass for livestock. This patch of vegetation was assessed using Streamlined assessment module – Planted native vegetation (Appendix D) of the BAM.

- 1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?**

No. Planted vegetation occurs as a stand-alone patch within the site. Historical imagery shows vegetation has been planted in straight rows and does not resemble a mosaic pattern nor does this vegetation form suitable connectivity between patches of remnant vegetation in the site or assessment area.

- 2. Is the planted native vegetation:**
 - a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and**
 - b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?**

No. While the assessing ecologist is not certain as to the specific reasons for planting of the vegetation within the property, it is considered likely to have been a matter of aesthetic motivation. The property has been under the ownership of the same family for more than 100 years. Historical imagery (figure 3.3) shows this strand of vegetation was planted post 1986. The canopy species were planted with even spacing and in straight lines. No mid or ground story species were planted. The planting pattern does not represent a mosaic pattern that one would use to replace or regenerate a plant community, threatened species population or habitat.

- 3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:**
 - a. a species recovery project**
 - b. Saving our Species project**
 - c. other types of government funded restoration project**
 - d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat**
 - e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)**
 - f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or**
 - g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?**

No, None of the above.

- 4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?**

Unlikely. As previously noted, planted vegetation lacks mid and ground story vegetation and was planted in straight rows with even spacing. Therefore, whilst it was voluntarily planted is more likely to have been motivated by provided greater aesthetic appeal for the residents who lived on the property.

- 5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such**

as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?

Yes. The location and structure of the plantings suggests the vegetation was planted for aesthetic and possible future harvesting purposes.

Planted Native Vegetation Assessment Result

Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

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

The assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation.

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

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

Figure 3.5 - Appendix D Section D2 of the Biodiversity Assessment Method 2020

Vegetation Zone 3

This zone represents the remaining area of the site located outside of any impacts on native vegetation.

- *Northern boundary and private cemetery.*

This zone proposes the construction of a small building on cleared ground along the northern boundary of the site, adjacent to the private cemetery and Old Bells Line Of Road. This area consists of cleared land with managed exotic turf lawn. As with the whole of the site, this area is a part of the required APZ, however the proposed building will not modify/remove any native vegetation and no changes to current management practices are proposed for this area, apart from minor landscaping. Edge effects of this zone on the adjacent vegetation Zone 1 have been captured in the impact assessment and subsequent future VI score for Zone 1, as the management and creation of APZ for Zone 1 will negate any potential impacts from the management of Zone 3. This area has been included in the operational and construction footprints of the DA, however due to their being no native vegetation or potential impacts on surrounding vegetation it has been excluded in the BAM-C.

- *Eastern mixed vegetation and ponds.*

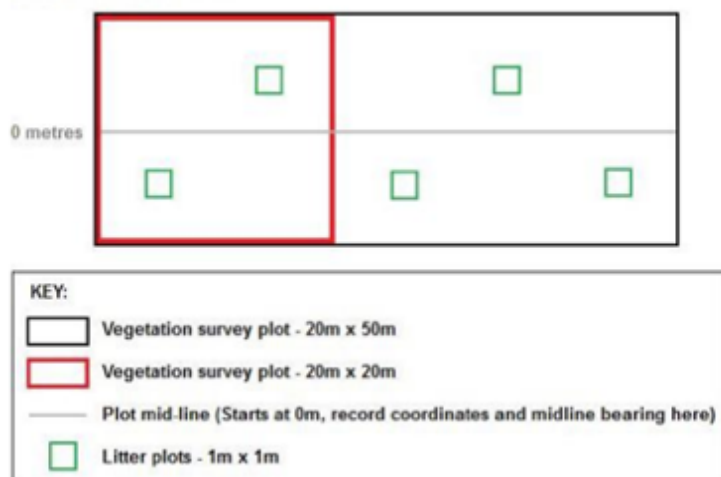
CumberlandPlainWest_VIS__4207 DPIE (2020) (Figure 3.1) depicts an area of Shale Sandstone Transition Forest in the Sydney Basin Bioregion (PCT1395) to be present in the eastern corner, however this is inaccurate of the current site condition. No modification or removal is proposed for this area of the site.

The vegetation in this zone consists of large areas of exotic pasture grasses; recent planted native canopy consistent with the structure of zone 2; and orchard trees. High threat weeds are present throughout this zone, historic and current management practices are continuing to impact the vegetation in this zone. This area is included in the operational footprint of the DA as the zone is required to be managed as an APZ, however no modification/removal is proposed to vegetation within this area in order to facilitate APZ creation (see bushfire assessment report). Therefore, this zone has been excluded within the BAM-C.

Stratification and plot dimensions

Both plots were as per the BAM Method. Plot two being 20x20 plots (400m²) and plot one being 40x10 (400m²). Both plots are used for assessing structure and composition. In plot two the centre line extended 50m to create a 20 x 50 plot (1000m²) to assess function. In plot one the centre line extended 100m to create a 10 x 100 plot (1000m²) to assess function. See Biodiversity Assessment Method Operational Manual – Stage 1 (OEH 2018) page 26-28 for methods used.

<https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-operational-manual-stage-1-180276.pdf>



3.2.3 Site Photos

Included are photos of BAM plots one and two.



Figure 3.6 - A drone shot above the subject site



Figure 3.7 - BAM Plot within vegetation Zone 1 along the road verge with Old Bells Line of Road.



Figure 3.8 - BAM Plot in Vegetation Zone 2 of planted trees. Data not used in BAM-C, used a referece for ecologists when assessing the site.



Plate 3.1 - Photos depict the marginal quality of vegetation on site. The whole site was inspected on foot.

4 Threatened Species

4.1 Flora and Fauna Field Survey

No threatened flora or fauna species were identified during Kingfisher 2020 field surveys.

4.1.1 Opportunistic Flora and Fauna survey methods

During opportunistic surveys, notes and photos were taken of the vegetation types and flora and fauna present onsite were recorded. Surveys were general and opportunistic in nature and were performed by traversing the site.

4.1.2 Diurnal Bird Surveys

Diurnal bird surveys occurred during mid-afternoon. Opportunistic observations of birds were made during vegetation surveys. Several species which are known to nest in hollows were predicted at the site and a dedicated effort was made to traverse the impact area to understand if hollows are present and if they are suitable for predicted bird species.

The site survey for birds primarily focused on their breeding habitat requirements such as hollows, waterways onsite, nests that are present and other features which BAM identified bird species may use for

breeding purposes. It was concluded that the impact area hosts potential foraging habitat for all birds species listed in the BAM calculator. Therefore, all bird species identified in the BAM calculator were retained in the assessment for foraging purposes.

It is unlikely that threatened avifauna would use the impact area for breeding purposes, due to lack of optimal breeding habitat (suitable hollows, suitable waterways). Justification for species exclusion in the BAM-C can be found in appendix I. Call playback was not conducted for forest owls, however targeted searches resulted in no individuals recorded on site.

4.1.3 Microbats

The impact area hosts marginal foraging habitat for threatened microbat species which are identified in the BAM calculator for the site. All microbat species have been retained in the BAM calculator for foraging purposes. The site survey for microbats primarily focused on their breeding habitat requirements such as caves, outcrops, hollows and other features which microbat species may use for breeding purposes.

It has been concluded that while microbat species may use the areas of the site for foraging purposes, they are unlikely to use the site for breeding purposes due to lack of optimal breeding opportunities within the impact area. Man-made structures may also provide habitat for microbats in the form of overhangs and accessible cavities. The two structures on the site were assessed from the exterior. Both structures were well maintained and provided no habitat for microbats. Therefore, impact assessment on microbat breeding habitat has been excluded from the BAM assessment.

4.1.4 Mammal Surveys

Mammal surveys occurred during the mid-afternoon. The proposed development is not expected to significantly impact upon breeding or foraging purposes for any mammal species identified in the BAM Calculator as there are no optimal habitat features within the development area.

4.1.5 Amphibian Surveys

Amphibian surveys occurred during the mid-afternoon. Opportunistic observations of amphibians were made during vegetation surveys. Any potential habitat features were investigated, however no threatened amphibian species identified in the BAM calculator were identified onsite. Habitat requirements for all threatened amphibian species identified in the BAM calculator are marginal within the impact area.

4.1.6 Reptile and Snail surveys

Reptile and Snail surveys were undertaken by thorough investigation of potential habitat including:

- Leaf litter
- Bark litter
- Stick piles
- Native ground cover vegetation
- Rocks
- Rubbish

Targeted searches were conducted for the Dural Land Snail (*Pommerhelix duralensis*) and Cumberland Plain Land Snail (*Meridolum corneovirens*). No threatened Reptile or Snail species were identified during site investigations.

4.1.7 Koala assessment summary

The following section addresses *State Environmental Planning Policy (Koala Habitat Protection) 2021*. The SEPP applies to this proposal as per Part 2 –Section 11 of the SEPP.

4.1.7.1 Survey effort

The survey guidelines within the Koala Habitat Protection Guideline (DPIE, 2020) (now repealed) and EPBC Act Referral Guidelines for the vulnerable koala published by Commonwealth Department of Environment (DotE; 2014) were used as a general guide for the survey. A targeted on-ground survey for the Koala was conducted on the site with each tree being directly observed. Binoculars were available for use however the trees are so distant and the canopies clear that a Koala would have been seen if present. Searches were also made in accessible surrounding land holdings and along road ways, binoculars were used here to facilitate clear sight into inaccessible areas (including some private property). Off-site observational surveys for koalas were opportunistic in nature and focused primarily where potential habitat is greatest (and accessible).

Desktop (Bionet, ALA) and on-ground surveys were conducted to determine the presence / absence of the species. The on-ground survey also contributed to information regarding habitat availability within the site. Indirect survey methods including; scat and scratching's searches (outlined in guiding documents) were conducted. No evidence of Koalas was found on site.

4.1.7.2 Analysis of potential impacts

The likelihood of direct or indirect impacts which may cause a significant and/or irreversible impact on the species is low. Ecologists have concluded this finding after a field assessment revealed that the remnant pockets of native vegetation exist in a significantly degraded state, there was no evidence of Koalas on the property via scat evidence, scratching's or otherwise.

Vegetation removal is a direct and unavoidable impact. However, due to the degraded nature of vegetation and habitat on site, the Koala has a low likelihood of occurrence. Additionally, the *Koala habitat assessment tool* (DotE; 2014) was used to determine the importance of habitat on site for the Koala. The site achieved a score of three (3) and is therefore unlikely to support a population of Koalas. Vegetation removal is unlikely to have a significant and/or irreversible impact on the species.

Several significant connectivity barriers including; urban development and major roads, encompass the site. These barriers further reduce the likelihood of occur for the Koala. Indirect impacts (dog attacks, vehicle strikes and human disturbance) are expected to be already occurring within the vicinity. As such, the proposal is unlikely to lead to a significant increase in indirect impacts such that the local population Koalas is placed at risk of extinction. Indirect impacts including; dog attacks, vehicle strikes and human disturbance are expected to be currently occurring within the surrounding landscape. It is unlikely that the proposal would significantly increase the rate at which these indirect incidents is expected to occur.

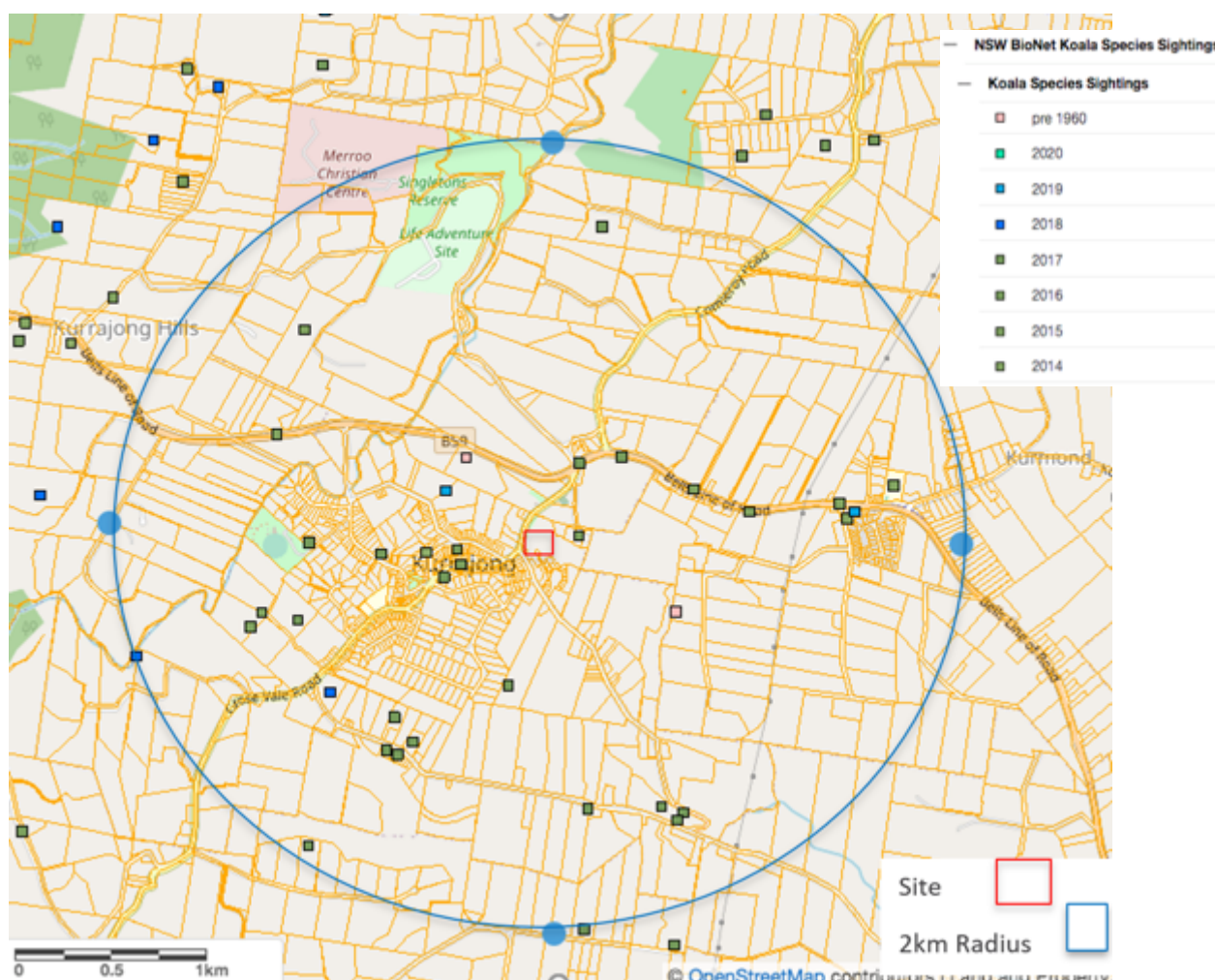


Figure 4.1 - Koala (*Phascolarctos cinereus*) species sightings map, published by DPIE.

4.1.7.3 Mitigation measures

The following mitigation measures are recommended. They aim to improve the condition of native vegetation on site and overall, increase the habitat suitability of the site, for the Koala.

Wildlife corridor/ Revegetation – Revegetation (which will also satisfy bush fire protection requirements) is recommended for the site, see Landscape Plan figure 1.4. These areas should be revegetated with Koala feed and browse trees. Locally native ground and mid-storey species are also recommended to support the habitat quality of the wildlife corridor. Such measures will also increase habitat connectivity of the surrounding landscape. Shrub and ground covers will also increase the habitat area for other wildlife including small insectivorous and insectivorous birds.

4.1.7.4 Conclusion

The site does not contain areas of optimal koala habitat and as such will avoid removal of habitat which may be critical to the survival of the species. Many areas of the site will remain vegetated with locally native species. Vegetation to be retained will be maintained and will satisfy APZ requirements. Patches of retained vegetation will also ensure that connectivity within the landscape is maintained. A majority of the development footprint occurs within areas of the site which are currently cleared. Tree removal will occur; however, the development has been designed to ensure areas of native vegetation can be retained and enhanced. There is expected to be an increase in vegetation condition post development. This can be

facilitated through effective bushland management programs. Planting of feed and browse tree species is recommended to encourage Koala back to the site. All Koala feed and browse trees should be retained in areas outside of the development footprint.

4.2 Threatened Flora - Desktop

A total of 12 threatened flora species have been recorded within 10km of the study site according to BioNet records. These species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 4.1). The vulnerable and endangered species to focus on-site searches for can be seen in Table 4.1 below highlighted in bold. This is based on likelihood of occurrence.

Table 4.1 - Threatened flora observed in previous ecological surveys within a 10km radius of the study site. NSW DPIE Bionet 2020.

| Family | Scientific Name | Common Name | NSW status | Comm. status | Records |
|-------------------------|--|--------------------------|------------|--------------|---------|
| Apocynaceae | <i>Cynanchum elegans</i> | White-flowered Wax Plant | E1 | E | 4 |
| Fabaceae (Faboideae) | <i>Dillwynia tenuifolia</i> | | V | | 3 |
| Grammitidaceae | <i>Grammitis stenophylla</i> | Narrow-leaf Finger Fern | E1,3 | | 5 |
| Ericaceae | <i>Leucopogon exolasius</i> | Woronora Beard-heath | V | V | 1 |
| Ericaceae | <i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i> | | E1 | | 2 |
| Myrtaceae | <i>Micromyrtus minutiflora</i> | | E1 | V | 3 |
| Proteaceae | <i>Persoonia nutans</i> | Nodding Geebung | E1,P | E | 2 |
| Thymelaeaceae | <i>Pimelea spicata</i> | Spiked Rice-flower | E1 | E | 2 |
| Myrtaceae | <i>Rhodamnia rubescens</i> | Scrub Turpentine | E4A | | 15 |
| Myrtaceae | <i>Syzygium paniculatum</i> | Magenta Lilly Pilly | E1 | V | 2 |
| Elaeocarpaceae | <i>Tetratheca glandulosa</i> | | V | | 3 |
| Rutaceae | <i>Zieria involucrata</i> | | E1 | V | 1 |

Note: E = Endangered, V = Vulnerable, P = Protected.

4.3 Threatened Fauna - Desktop

A total of 35 threatened fauna species have been recorded within 10km of the study site according to BioNet records. These species are currently listed as vulnerable or endangered under state and/or commonwealth legislation (see Table 4.2). The vulnerable and endangered species to focus on-site searches for can be seen in Table 4.2 below highlighted in bold. This is based on likelihood of occurrence.

Table 4.2. Threatened fauna observed in previous ecological surveys within a 10km radius of the study site.
NSW DPIE Bionet 2020.

| Class | Scientific Name | Common Name | NSW Status | Comth. Status | No. of records |
|-----------------|--|---|------------|---------------|----------------|
| Myobatrachidae | <i>Pseudophryne australis</i> | Red-crowned Toadlet | V,P | | 3 |
| Meliphagidae | <i>Anthochaera phrygia</i> | Regent Honeyeater | E4A,P | CE | 4 |
| Artamidae | <i>Artamus cyanopterus cyanopterus</i> | Dusky Woodswallow | V,P | | 5 |
| Cacatuidae | <i>Callocephalon fimbriatum</i> | Gang-gang Cockatoo | V,P,3 | | 8 |
| Cacatuidae | <i>Calyptorhynchus lathami</i> | Glossy Black-Cockatoo | V,P,2 | | 1 |
| Acanthizidae | <i>Chthonicola sagittata</i> | Speckled Warbler | V,P | | 2 |
| Neosittidae | <i>Daphoenositta chrysoptera</i> | Varied Sittella | V,P | | 4 |
| Meliphagidae | <i>Epthianura albifrons</i> | White-fronted Chat | V,P | | 2 |
| Meliphagidae | <i>Grantiella picta</i> | Painted Honeyeater | V,P | V | 1 |
| Accipitridae | <i>Hieraaetus morphnoides</i> | Little Eagle | V,P | | 1 |
| Psittacidae | <i>Lathamus discolor</i> | Swift Parrot | E1,P,3 | CE | 8 |
| Accipitridae | <i>Lophoictinia isura</i> | Square-tailed Kite | V,P,3 | | 6 |
| Meliphagidae | <i>Melithreptus gularis gularis</i> | Black-chinned Honeyeater (eastern subspecies) | V,P | | 1 |
| Strigidae | <i>Ninox strenua</i> | Powerful Owl | V,P,3 | | 11 |
| Laridae | <i>Onychoprion fuscata</i> | Sooty Tern | V,P | | 1 |
| Pachycephalidae | <i>Pachycephala olivacea</i> | Olive Whistler | V,P | | 3 |
| Petroicidae | <i>Petroica boodang</i> | Scarlet Robin | V,P | | 5 |

| Class | Scientific Name | Common Name | NSW Status | Comth. Status | No. of records |
|------------------|---------------------------------------|---------------------------------|------------|---------------|----------------|
| Petroicidae | <i>Petroica phoenicea</i> | Flame Robin | V,P | | 1 |
| Tytonidae | <i>Tyto novaehollandiae</i> | Masked Owl | V,P,3 | | 1 |
| Camaenidae | <i>Meridolum corneovirens</i> | Cumberland Plain Land Snail | E1 | | 1 |
| Burramyidae | <i>Cercartetus nanus</i> | Eastern Pygmy-possum | V,P | | 2 |
| Vespertilionidae | <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat | V,P | V | 8 |
| Dasyuridae | <i>Dasyurus maculatus</i> | Spotted-tailed Quoll | V,P | E | 11 |
| Vespertilionidae | <i>Falsistrellus tasmaniensis</i> | Eastern False Pipistrelle | V,P | | 9 |
| Molossidae | <i>Micronomus norfolkensis</i> | Eastern Coastal Free-tailed Bat | V,P | | 26 |
| Miniopteridae | <i>Miniopterus australis</i> | Little Bent-winged Bat | V,P | | 7 |
| Miniopteridae | <i>Miniopterus orianae oceanensis</i> | Large Bent-winged Bat | V,P | | 23 |
| Vespertilionidae | <i>Myotis macropus</i> | Southern Myotis | V,P | | 13 |
| Petauridae | <i>Petaurus australis</i> | Yellow-bellied Glider | V,P | | 1 |
| Petauridae | <i>Petaurus norfolcensis</i> | Squirrel Glider | V,P | | 10 |
| Phascolarctidae | <i>Phascolarctos cinereus</i> | Koala | V,P | V | 150 |
| Pteropodidae | <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox | V,P | V | 33 |
| Emballonuridae | <i>Saccolaimus flaviventris</i> | Yellow-bellied Sheath-tail-bat | V,P | | 6 |
| Vespertilionidae | <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat | V,P | | 10 |
| Vespertilionidae | <i>Vespadelus troughtoni</i> | Eastern Cave Bat | V,P | | 1 |

Note: E = Endangered, V = Vulnerable, P = Protected.

Likelihood of occurrence

See Appendix I for a 'Rationale for Likelihood of Occurrence', which outlines why species have been retained or omitted from BAM calculations. Reasons for inclusion or removal are based on species habitat preferences, site investigations, species survey, Bionet records and expert opinion. During the survey, none of the above threatened species were observed on-site. Marginal foraging habitat for several species is present onsite. Thus, all predicted species were retained in the BAM-C. A single candidate species generated species credit species due to the impact on foraging habitat.

Stage 2: Impact Assessment

5 BAM Calculator

5.1 Vegetation Zones and Integrity Scores

Of the 3 vegetation zones on site only Zone 1 was assessed in the BAM-C. The vegetation zone covers an area in which native vegetation is proposed for removal and/or modification. It has been left as a single management zone; APZ.

Future vegetation integrity (F-VI) scores in the BAM-C, for APZ management zones are reflective of Inner Protection Area (IPA) maintenance practices as outlined in Planning for Bush Fire Protection (PBP) NSW RFS (2019). Within the APZ, species diversity is expected to remain as per current survey results. However, the structural attributes of the vegetation will be modified in the APZ, therefore F-VI scores were adjusted accordingly.

Table 5.1 – Table of the vegetation integrity score.

| PCT | Vegetation Zone | Area (ha) | Vegetation Integrity Score | Change in Vegetation integrity | PCT % Cleared |
|-------------|-----------------|-----------|----------------------------|--------------------------------|---------------|
| 1281 (STIF) | One | 0.98 | 51.6 | -21.6 | 90 |

Zone one





Initial assessment concluded that the vegetation which runs adjacent to Old Bells Line of Road appears to have the highest vegetation integrity. This zone is in marginal condition with a high abundance of exotic vegetation scattered throughout. Possibly remnant, *E. tereticornis* are present on the road verge with Old Bells Line of Road. Historical imagery available through NSW spatial portal reveals majority of the site has been previously cleared, however the vegetation along Old Bells Road at the western portion of the site appears to have persisted since at least 1975 and may form part of the original vegetation community. Sections of this vegetation zone has been planted by the landowner.

The combination of historical plantings and poor species composition hinder the ability to differentiate between a number of PCTs that could occur within this patch such as PCT 792 and PCT 1395. Therefore, this vegetation has been assessed as Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion (PCT1281) in the BAM-C. This finding was concluded following desktop investigations and field plot-based assessments and the experience of the assessing ecologist with vegetation in this area of NSW. This patch of vegetation is highly disturbed, assessment of the associated TEC (STIF) is similarly hindered by the lack of native vegetation and previous site disturbances. As a result, a precautionary approach was taken and assumed that if managed correctly the seedbank of the original PCT would be likely to exist and vegetation was assessed as Sydney Turpentine-Iron Bark Forest (STIF) TEC, in the BAM -C, albeit in poor condition.

Patch size assigned to the vegetation zone was concluded to be >100 ha. Vegetation on site is less than 100 m from native vegetation of the adjoining properties. Scattered remnant trees are common across the

landscape within the assessment area and form connection to larger native vegetation throughout the assessment area.

The vegetation zone has been left as a single management zone within the BAM-C. This will reflect the future actions; Asset Protection Zone (APZ) (0.98ha).

| # | Import | PCT code | Condition class * | Vegetation zone name | Patch Size* | Area (ha)* | Location * | Composition condition score | Structure condition score | Function condition score | Current vegetation integrity score | Management zones | Delete |
|---|---|----------|-------------------|----------------------|-------------|------------|---|-----------------------------|---------------------------|--------------------------|------------------------------------|---|---|
| 1 |  | 1281 | Poor | 1281_Poor | 100 | 0.98 |  | 35.6 | 48.1 | 80 | 51.6 |  |  |

Vegetation zones (Future vegetation integrity score)

| # | PCT code | Condition class | Vegetation zone name | Patch Size | Management zone | Area (ha) | Composition condition score | Structure condition score | Function condition score | Vegetation integrity (VI) score | Change in VI score | Total VI loss |
|---|----------|-----------------|----------------------|------------|-----------------|-----------|-----------------------------|---------------------------|--------------------------|---------------------------------|--------------------|---------------|
| 1 | 1281 | Poor | 1281_Poor | 100 | APZ | 0.98 | 29.9 | 13.8 | 65.1 | 30 | -21.6 | -21.6 |

Figure 5.1 - Extract from BAM-C assessment, displaying vegetation and management zone.



Figure 5.2. Vegetation zone one assessed in the BAM-C.

5.2 Species and Ecosystem Credits

The grand total cost to offset both ecosystem credits and species credits generated by this development is \$149,878.09 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. A credit is a unit used to measure the impact of a development. Credits have a price and are traded by the Biodiversity Conservation Trust (BCT) under the Biodiversity Conservation Scheme (BOS). A credit may be created due to a number of factors including but not limited to, amount of vegetation removed, critical habitat removed and alteration of the landscape.

| IBRA sub region | PCT common name | Threat status | Offset trading group | Risk premium | Administrative cost | Methodology adjustment factor | Price per credit | No. of ecosystem credits | Final credits price |
|-------------------------------------|--|---------------|---|--------------|---------------------|-------------------------------|------------------|--------------------------|---------------------|
| Cumberland | 1281 - Sydney Turpentine - Ironbark forest | Yes | Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion | 18.83% | \$302.25 | 1.7832 | \$9,281.37 | 13 | \$120,657.82 |
| Subtotal (excl. GST) | | | | | | | | | \$120,657.82 |
| GST | | | | | | | | | \$12,065.78 |
| Total ecosystem credits (incl. GST) | | | | | | | | | \$132,723.60 |

Species credits for threatened species

| Species profile ID | Species | Threat status | Price per credit | Risk premium | Administrative cost | No. of species credits | Final credits price |
|-----------------------------------|---|---------------|------------------|--------------|---------------------|------------------------|---------------------|
| 10157 | <i>Chalinolobus dwyeri</i> (Large-eared Pied Bat) | | \$741.31 | 20.6900% | \$80.00 | 16 | \$15,594.99 |
| Subtotal (excl. GST) | | | | | | | \$15,594.99 |
| GST | | | | | | | \$1,559.50 |
| Total species credits (incl. GST) | | | | | | | \$17,154.49 |

| | | | | | | | | |
|---------------------------------------|--|--|--|--|--|--|-------------|--------------|
| Calculated as on: 20/10/2021 17:16:47 | | | | | | | Grand total | \$149,878.09 |
|---------------------------------------|--|--|--|--|--|--|-------------|--------------|

Figure 5.3 - Credit summary from the BAM calculator.

5.2.1 Ecosystem Credit Species derived from BAM

The development and associated works generated 13 ecosystem credits for the site. In total the cost to offset the species credits generated will be \$132,723.60 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. See below, Figure 5.4 for the ecosystem credit summary.

Table 5.2 - Ecosystem Credit Species Retained in the BAM

- | | |
|---|--|
| - Barking Owl (<i>Ninox connivens</i>) | - Masked Owl (<i>Tyto novaehollandiae</i>) |
| - Black-chinned Honeyeater (eastern subspecies) (<i>Melithreptus gularis gularis</i>) | - New Holland Mouse (<i>Pseudomys novaehollandiae</i>) |
| - Dusky Woodswallow (<i>Artamus cyanopterus</i>) | - Painted Honeyeater (<i>Grantiella picta</i>) |
| - Eastern Coastal Free-tailed Bat (<i>Micronomus norfolkensis</i>) | - Powerful Owl (<i>Ninox strenua</i>) |
| - Flame Robin (<i>Petroica phoenicea</i>) | - Regent Honeyeater (<i>Anthochaera phrygia</i>) |
| - Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>) | - Rosenberg's Goanna (<i>Varanus rosenbergi</i>) |
| - Glossy Black-Cockatoo (<i>Calyptorhynchus lathamii</i>) | - Scarlet Robin (<i>Petroica boodang</i>) |
| - Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) | - Speckled Warbler (<i>Chthonicola sagittata</i>) |
| - Hooded Robin (south-eastern form) (<i>Melandryas cucullata</i>) | - Spotted-tailed Quoll (<i>Dasyurus maculatus</i>) |
| - Koala (<i>Phasocartos cinereus</i>) | - Square-tailed Kite (<i>Lophoictinia isura</i>) |
| - Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>) | - Swift Parrot (<i>Lathamus discolor</i>) |
| - Little Bent-winged Bat (<i>Miniopterus australis</i>) | - Turquoise Parrot (<i>Neophema pulchella</i>) |
| - Little Eagle (<i>Hieraaetus morphnoides</i>) | - Varried Sittella (<i>Daphoenositta chrysoptera</i>) |
| - Little Lorikeet (<i>Glossopsitta pusilla</i>) | - White-throated Needletail (<i>Hirundapus caudacutus</i>) |
| | - Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>) |

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

| IBRA sub region | PCT common name | Threat status | Offset trading group | Risk premium | Administrative cost | Methodology adjustment factor | Price per credit | No. of ecosystem credits | Final credits price |
|-------------------------------------|--|---------------|---|--------------|---------------------|-------------------------------|------------------|--------------------------|---------------------|
| Cumberland | 1281 - Sydney Turpentine - Ironbark forest | Yes | Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion | 18.83% | \$302.25 | 1.7832 | \$9,281.37 | 13 | \$120,657.82 |
| Subtotal (excl. GST) | | | | | | | | | \$120,657.82 |
| GST | | | | | | | | | \$12,065.78 |
| Total ecosystem credits (incl. GST) | | | | | | | | | \$132,723.60 |

Figure 5.4 - Ecosystem credit summary from the BAM calculator.

5.2.2 Species Credit Species derived from BAM

The development and associated works generated species credits for the Large-eared Pied Bat (*Chalinolobus dwyeri*). In total the cost to offset the species credits generated will be \$17,154.49 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. The individual credit price for species credits can be seen below in Figure 5.5. The species polygon as per BAM 6.4 is included in appendix VI.

Species credits for threatened species

| Species profile ID | Species | Threat status | Price per credit | Risk premium | Administrative cost | No. of species credits | Final credits price |
|-----------------------------------|---|---------------|------------------|--------------|---------------------|------------------------|---------------------|
| 10157 | <i>Chalinolobus dwyeri</i> (Large-eared Pied Bat) | | \$741.31 | 20.6900% | \$80.00 | 16 | \$15,594.99 |
| Subtotal (excl. GST) | | | | | | | \$15,594.99 |
| GST | | | | | | | \$1,559.50 |
| Total species credits (incl. GST) | | | | | | | \$17,154.49 |

Figure 5.5 - Species credit summary from the BAM calculator.

It has been concluded that not all land within the impact area holds suitable habitat for threatened species. Thus, some species have been excluded due to severe habitat degradation. References used for the rationale table are species records from Bionet and information from the relevant DPIE species profile for each species and from the Threatened Biodiversity Data Collection.

Appendix I lists the species credit species predicted by the BAM Calculator and details whether the species have been further assessed based on site suitability (i.e. Habitat constraints and/or habitat degradation within the development site). Under Section 6.4.1.13 of the BAM, further species credit species can be excluded from further assessment if an assessment of habitat constraints and microhabitats determines that the habitat within the development site is substantially degraded such that the species credit species is unlikely to occur.

6 Direct Impacts



Figure 6.1 - Proposed impacts on vegetation within the site.

Impacts associated with Zone 1 were used to generate credits in the BAM-C. Impacts in planted vegetation in zone 2 were not assessed for vegetation credits under the streamline assessment of appendix D. Vegetation within zone 2 was assessed for threatened species habitat in Appendix VI.

6.1.1 Vegetation disturbance and Loss

A small portion of planted native vegetation (approximately 0.2 ha) in Zone 2 will be removed to accommodate for the proposed development. The development site is substantially degraded such that the original vegetation community is unlikely to recover. Areas of potential habitat for STIF will be lost, although the site has been subject to vegetation removal and modification for the previous 200 years. This vegetation was assessed using the Planted Native Vegetation Module of the BAM (refer to Section 3.2.2). No further assessment of vegetation loss is required.

Vegetation within zone 1 will be modified to accommodate the APZ requirements of the development (0.98ha) although impacts will not be irreversible. Impacts were calculated as per BAM Operational Manual Stage 2 and in line with the Fire and Vegetation Management Plan (Kingfisher, 2021). Species diversity is expected to be predominantly retained. Tree cover will be reduced to 15% mature cover and shrubs and other growth form groups that generally occur in the midstory will be cleared. Ongoing slashing and mowing of the understory will be required to maintain the APZ, however current cover attributes for grasses, forbs and other ground species are within the prescribed parameters of the future APZ requirements, and thus will remain the same. BAM – C results of this impact was calculated as a loss of vegetation integrity of -21.6.

7 Indirect Impacts

7.1.1 Weed growth and invasion

Weed species are present and must be properly managed so they do not spread.

At the direct works zone weeds are to be managed by stopping seed spread on machinery, tools, equipment and worker clothes (e.g. boots). Additionally, after weed removal around the perimeter area of the construction, there must be continuous maintenance of the site otherwise it may result in increased weed growth, exacerbated by the high abundance of weeds present pre-works.

Weeds will colonize and pioneer on any cleared grounds so must be managed throughout the duration of the project as well as on-going post works

7.1.2 Introduction of pathogens

The introduction of pathogens may occur into the site, and surrounding remnant bushland, via machinery, tools, equipment and worker clothing (e.g. boots). Diseases to watch out for include Phytophthora (also known as Root Rot – type of water mould) and Myrtle Rust (*Puccinia psidii* – type of fungus). See Appendix for Bushland Hygiene Protocols for Phytophthora.

7.1.3 Soil disturbance and erosion

The removal of vegetation and trees can result in soil disturbance. The soil appears to be sodic thus erosion can occur at a faster rate. Soil compaction could occur from machinery use. It is recommended that soil compaction in non-built upon areas is to be avoided and not to occur within the trees to be retained. Replacement of woody debris and a covering of organic matter over the cleared site will prevent erosion and is highly recommended.

7.1.4 Water Quality

There are no streams present onsite however the proposed actions may result in transport of sediment from the work zones because of increased storm water runoff to areas downslope. Dams on site may be subject to impacts of water quality, riparian vegetation and aquatic fauna. Recommendations to maintain and improve water quality on site have been listed in section 10 below.

Table 7.1 - Summary of Indirect Impacts

| Nature of Impact | Extent | Duration |
|------------------------------|--|--|
| Weed growth and invasion | Within development area | During and post construction |
| Introduction of pathogens | Within the site and surrounding vegetation | During and post construction |
| Soil disturbance and erosion | Within the site access route and development footprint | During vegetation removal and construction phase |
| Water quality | Onsite dams located down slope of the construction. Unlikely to affect water quality off site | During all phases of construction |

8 Serious and Irreversible Impact Assessment (SAIL)

The following section provides details which address section 10.2 of the Biodiversity Assessment Method (BAM) and thus has referenced the guiding document *Guidance to assist a decision-maker to determine a serious and irreversible impact* in order to satisfy BAM requirements.

The document *Guidance to assist a decision-maker to determine a serious and irreversible impact* outlines the steps taken determine serious and irreversible impacts in section 3.2. The steps are as follows;

- Step one: Identify relevant entities at risk of a SAIL
- Step two: Evaluate the extinction risk of the entity to be impacted
- Step three: Detail measures taken to avoid, minimise and mitigate impacts on the entity
- Step four: Evaluate a serious and irreversible impact
- Step five decision making

8.1.1 Step one - Identify relevant entities at risk of a SAIL

Following 3.2.1 in *Guidance to assist a decision-maker to determine a serious and irreversible impact*;

The Biodiversity Assessment Report (BAR) will identify species or ecological communities at risk of a SAIL that are likely to be affected by the proposal. These entities are identified in the BAM Calculator (BAM-C). The front page of the credit report provided by the BAM-

C will also identify all the entities that are considered to be at risk of a SAIL and are impacted on by the proposal.

The BAM-C Credit report can be found in appendix IV.

The following section identifies SAIL entities recognised by the BAM Calculator as being at risk of a serious and irreversible impact. Description of the principles for the Listed entities are available in the *Guidance to assist a decision-maker to determine a serious and irreversible impact* and are summarised as:

- Principle 1 – species or ecological community currently in a rapid rate of decline
- Principle 2 – species or ecological communities with a very small population size
- Principle 3 – species or area of ecological community with very limited geographic distribution
- Principle 4 – species or ecological community that is unlikely to respond to management and is therefore irreplaceable

The list of SAIL entities identified by the document was accessed via;

<https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/biodiversity-offsets-scheme/serious-and-irreversible-impacts>

Table 8.1 - All SAIL entity recognised by the BAM Calculator for the site.

| Scientific Name | Common Name | Biodiversity Risk Weighting | Principles | | | |
|---|---|-----------------------------|------------|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat | 2.5 | | | | X |
| Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). | Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). | 3 | X | X | | |

8.1.2 Step two - Evaluate the extinction risk of the entity to be impacted

• Large-eared Pied Bat (*Chalinolobus dwyeri*)

Habitat removal for the Large-eared Pied Bat (*Chalinolobus dwyeri*) is a serious concern as the species is unlikely to respond to management (Principle 4). Optimal maternity or breeding habitat is not present for the species within the impact area or the site. Breeding habitat such as caves, outcrops, suitable hollows and other features which microbat species may use for breeding purposes for were not identified within the impact area or onsite. No viable hollows were identified within the impact area, it is unlikely that the species would use the area as breeding habitat due to surrounding disturbance and degraded habitat.

The impact area hosts marginal foraging habitat for microbats in the form of canopy cover and insect abundance. These trees are expected to be retained, however modifications associated with APZ requirements will, result in a further loss of marginal foraging habitat. Alterations and degradation of habitat onsite pre BDAR would have caused a greater disruption to the species than the proposed development.

Foraging habitat will lost, however it is expected that the trees are not significantly contributing towards the long-term survival of the species, as it is considered to be marginal habitat, only to be used occasionally or opportunistically. It is expected that the local population of Large eared pied bat (*Chalinolobus dwyeri*) will

not be significantly affected by the proposed development as they are highly mobile and may only use the site occasionally.

- **Sydney Turpentine-Ironbark Forest (STIF)**

Sydney Turpentine-Ironbark Forest (STIF) satisfies Principle 1 and 2 of SAIL criteria;

- Principle 1 – species or ecological community currently in a rapid rate of decline
- Principle 2 – species or ecological communities with a very small population size

The proposed development will have an approximate impact area of 0.98ha within the >10ha patch of STIF. Vegetation on site has been significantly altered such that the site does not reflect the natural structural attributes of STIF. Many areas are dominated by exotic grasses and have been planted by the property owner. The patch of vegetation adjacent to Old Bells Line of Rd marginally reflects attributes of the STIF community. The majority of vegetation in this area is regrowth and is not remnant. The patch is also dominated by exotic species. The primary impact will be vegetation modification, to satisfy APZ requirements. It is expected that approximately 0.98ha of vegetation will be impacted by the APZ creation. The current estimated extent of STIF is 2300ha. The modification of STIF within the site comprises <0.05% of the current estimated extent. The proposed development is not expected to significantly contribute to loss of STIF due to the degraded nature of the site.

8.1.3 Step three - Detail measures taken to avoid, minimise and mitigate impacts on the entity

- **Large-eared Pied Bat (*Chalinolobus dwyeri*)**

It has been established that maternity or breeding habitat is not present within the impact area for the Large-eared Pied Bat (*Chalinolobus dwyeri*). The impact area hosts marginal foraging habitat for the species in the form of canopy cover and insect abundance. To avoid additional disturbance on potential foraging habitat, only vegetation which requires removal because of proximity to the proposed development or the need to conform the bushfire protection requirements will be removed or modified.

Four microbat nest boxes are recommended for installation within the site boundaries. This will increase the potential for microbats to roost in the area post development. Native species landscaping across the site is also recommended to increase potential habitat area for the Large-eared Pied Bat (*Chalinolobus dwyeri*).

- **Sydney Turpentine-Ironbark Forest (STIF)**

The proposal is expected to have a negligible impact upon STIF as core habitat for STIF will not be removed. The vegetation proposed for removal is not considered to form part of the original plant community and the vegetation in Zone 1 is in poor condition and it is unlikely that the original vegetation community would recover without assistance.

The proposal includes revegetation areas, these areas are to be revegetated using species selected from the STIF planting list. Delineation of works areas and exclusion zones for all vegetation to remain have been recommended.

8.1.4 Step four - Evaluate a serious and irreversible impact

- **Large-eared Pied Bat (*Chalinolobus dwyeri*)**

Maternity or breeding habitat is not present for the species within the impact area or onsite. The impact area hosts marginal foraging habitat for microbats in the form of canopy cover and insect abundance. Foraging habitat will be modified, however it is expected that the trees are not significantly contributing towards the long-term survival of the species, as it is considered to be marginal habitat, only to be used occasionally or opportunistically. It is expected that the proposal will not cause a disruption to the lifecycle to the Large-eared Pied Bat (*Chalinolobus dwyeri*). Therefore, the species will not be placed at risk of a serious or irreversible impact.

- **Sydney Turpentine-Ironbark Forest (STIF)**

The proposed development assessed in this BDAR is not expected to significantly contribute to loss of STIF due to the poor condition of vegetation onsite. Vegetation is both structurally and functionally poor due to historical actions on site. It is unlikely that this proposal would place STIF at risk of extinction or cause a serious or irreversible impact.

Stage 3: Improving Biodiversity Values

9 Avoid and minimise impacts

9.1 Prescribed impacts

The development will not significantly impact features outlined in Table 9.1 below. The proposed actions will not affect water quality as there will be erosion and silt management controls onsite to prevent runoff. Below is a table showing the potential impact the development would have on features that threatened species or communities can be dependent on.

Human made structures expected to be removed are present within the site in the form of two structures. The house is in good condition and does not provide suitable habitat to threatened species, particularly species of micro-bat that roost in cracks and crevices. The demolition of this structure will not impact on species habitat.

Non-native vegetation is scattered throughout the property in the form of exotic pasture grass. These areas are well maintained and managed as pasture for livestock. These areas of non-native vegetation are not expected to provide critical habitat for threatened species.

Table 9.1 - Expected impact on potential habitat onsite.

| Feature | Present | Description of feature characteristics and location | Potential Impact | Threatened species or community using or dependent on feature | Section of the BAR where prescribed impact is addressed. |
|--|---------|---|------------------|---|--|
| Karst, caves, crevices, cliffs or other geologically significant feature | No | N/A | N/A | N/A | N/A |
| Rocks | No | N/A | N/A | N/A | N/A |
| Human made structure | Yes | House within the development site | Negligible | N/A | N/A |
| Non-native vegetation | Yes | Scattered throughout | Negligible | N/A | N/A |



Figure 9.1 - Impacts to potential habitat features listed in table 9.1 on site.

9.2 Avoid and Minimise Impacts

Measures taken to avoid and minimise impacts on biodiversity values including prescribed impacts are detailed below.

Location

The location of the proposed development footprint is situated in an area of the site with sparse planted native vegetation. This location was selected to minimise the impacts to biodiversity values on the site and retain as many trees as possible. Other alternative locations would only increase the impacts on biodiversity values. Access from Vincents Road is constrained to the pre-existing road adjacent to the site. Alternative development locations would require creating a new access road which would involve the additional removal of native vegetation within the site.

Design

The associated Fire and Vegetation Management Plan highlights key landscape design features designed to minimise the impacts associated with the development. Native species plantings and weed management will increase the biodiversity outcomes post development, whilst maintaining APZ requirements. Further details have been provided in Section 10.

10 Recommendations

10.1.1 Wildlife corridor/ Revegetation

As per the Landscaping Plan (Figure 1.4 - enviro studio/JLA) two native regeneration areas will be established within Management Zone 2 (figure 10.1). The objective within the native regeneration areas is to enhance the diversity of native vegetation and habitat. Native regeneration areas (and adjoining landscaped areas) will be required to satisfy *NSW Rural Fire Service's document 'Standards for Asset Protection Zones' (PBP, 2019)*.

Planted vegetation should be sparsely distributed to ensure APZ maintenance tasks (brush-cutting/slashing) can be conducted throughout the year. The native regeneration areas must achieve; <10% cover for shrub and ground stratum and <15% canopy cover for trees at maturity. There is a lack of native flora diversity at present and it is expected that sparsely distributed plantings will enhance diversity and habitat opportunities. The planting schedule for native regeneration areas is included in Landscaping Plan (enviro studio/JLA) and the FVMP (Kingfisher, 2021).

Species plantings should aim to restore maximum diversity at the site. This will provide greater foraging and nesting habitat for native species and will deliver greater biodiversity gain outcomes. Native revegetation areas should be revegetated with Koala feed and browse trees, to encourage Koalas to the site. Locally native ground and mid storey species are also recommended to support the habitat quality of the wildlife corridor. Such measures will also increase habitat connectivity of the surrounding landscape. Shrub and ground covers will also increase the habitat area for other wildlife including small insectivorous and insectivorous birds.

Figure 10.1 identifies the proposed location for revegetation activities. Such actions will increase biodiversity within the site and the immediate landscape.

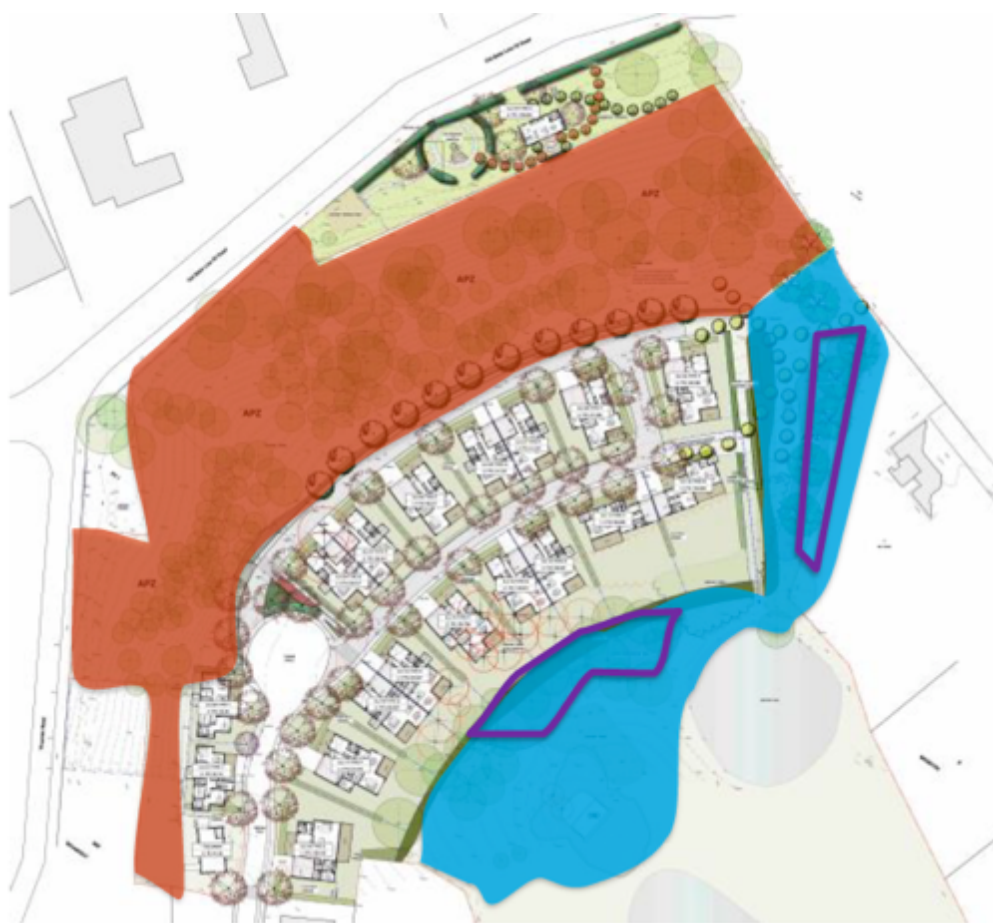


Figure 10.1 - Landscape Management Zones – Red = Management Zone 1 and Blue = Management Zone 2. Purple (within MZ 2) = Areas of Native regeneration (see landscaping plan and FVMP).

10.1.2 Asset Protection Zone Management

It is recommended that the APZ be brush-cut / slashed periodically throughout the year. This biomass reduction will be combined with weed removal to continue to improve the biodiversity and reduce long-term maintenance.

Maintenance of APZ

Litter fuels within the APZ should be kept below 2cm in height and be discontinuous. When establishing and maintaining an APZ the following requirements apply;

Trees:

- Canopy cover should be less than 15% (at maturity)
- Trees (at maturity) should not touch
- Lower limbs should be removed up to a height of 2m above ground
- Canopies should be separated by 2 to 5m
- Preference should be given to smooth barked and evergreen trees, except where there are major habitat considerations.

- Woody weeds controlled to lower bushfire risk and achieve less than 10% cover.

Shrubs:

- Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings.
- Shrubs should not be located under trees.
- Shrubs should not form more than 10% ground cover.
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- Woody weeds controlled to lower bushfire risk and achieve less than 10% cover.

Ground layer:

- Should be kept mown (as a guide grass should be kept to no more than 200mm in height) leaves and vegetation debris should be removed.
- Workers or machinery used in construction and asset protection zone creation may potentially act as vectors for plant disease and cause trampling damage to the species or potential habitat if bush hygiene protocols and work area delineation measures are not followed.
- Brush-cut / slashed bi-monthly throughout the year

10.1.3 Weed management

Low impact bushland regeneration methods should be utilised to meet weed control performance criteria in all areas of remnant native vegetation, to prevent unnecessary impacts to native vegetation and disturbance to soil. Low impact bush regeneration methods include the manual removal of herbaceous weeds and their propagules by hand and with hand tools. All bush regeneration activities requiring the use of chemicals must be performed in accordance with the NSW *Pesticides Act 1999*. Herbicides must not be applied whilst exotic plants are setting seeds.

10.1.4 Delineation of work areas

During construction, impacts to the site and adjacent vegetation should be minimised by the delineation of works zones. Access to the site would be best restricted to the development footprint only. An environmental exclusion zone is proposed for vegetation outside work areas.

10.1.5 Vegetation clearing control measures

An ecologist should be present on-site during vegetation clearing to ensure no fauna are harmed as a result of clearing. Prior to vegetation clearing an ecologist is required to conduct a pre-clearance survey to note any potential fauna or salvageable habitat features to be re-used on site.

10.1.6 Tree Protection

Tree protection will be consistent with the Tree Survey. Main trees to be managed are trees within close proximity to building works NB: see final tree survey for details and tree numbers.

10.1.7 Weed Removal Techniques

Weed removal proposed for the site will consist of hand removal techniques, manual/mechanical removal using bush regenerator tools and winter thermal (flame) weeding. This approach will reduce the amount of herbicide used and reduce the amount of off-target damage through spot on application.

Woody perennial weeds less than 2 metres in height will require cut and paint or scrape and paint bush regenerator techniques based on the germinating/epicormic behaviour of the plant (especially plants that tend to coppice or sucker).

It is recommended that seed heads are removed prior to commencement of primary works. This would be best performed carefully by hand with secateurs with the aim of avoiding the spread flowers or seeds into planting zones.

See Appendix III for further details. For key weed photo guide see Appendix VII.

10.1.8 Native Seed Collection

Any native trees or shrubs being removed for the construction works should be checked for seeds during removal works. If seeds are present, they should be collected and used off-site, location to be determined with council.

10.1.9 Nest boxes

Installation of a 4 nest boxes designed for microbats should be added to the site to increase roosting opportunities in the area.

Image from: nestboxes.com.au



10.1.10 Pathogen prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix III should be followed. The site is considered to be an area which may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

Table 10.1 - Summary of Mitigation Actions and Responsibilities

| Action Outcome | Timing | | | Responsibility |
|------------------------------------|--------|--------|------|--|
| | Pre | During | Post | |
| Wildlife Corridor and Revegetation | | X | X | Property owner/building contractor/ Project Ecologist |
| Asset Protection Zone Management | | | X | Property owner/building contractor/ Bushfire Consultant |
| Weed Management | X | X | X | Property owner/building contractor/ Bush Regeneration Specialist |
| Delineation of Work Areas | X | X | | Property owner/building contractor |
| Vegetation Clearing Control | X | X | | Property owner/building contractor/ Project Ecologist |
| Tree Protection | X | X | | Property owner/building contractor/ Project Arborist |
| Native Seed Collection | X | | | Property owner/building contractor/ Project Ecologist |
| Nest Boxes | X | | | Property owner/building contractor/ Project Ecologist |
| Pathogen Prevention | X | X | | Property owner/building contractor/ Bush Regeneration Specialist |

11 Conclusions

The proposed development will have an approximate impact area of 0.98ha on Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). This vegetation has been significantly altered and degraded from its natural state. The total cost to offset both ecosystem credits and species credits generated by this development is \$149,878.09 (including GST), assuming payment will be made into the Biodiversity Conservation Fund.

12 Appendices

12.1 Appendix I – Rationale for Likelihood of Occurrence

Rationale for Likelihood of Occurrence all Species Credit Species (candidate species) predicted by the BAM Calculator (BAM-C) and details whether the species have been retained or omitted from the calculator.

Where a species has a specific habitat constraint, which is not present within the subject land, or if the species is a vagrant within the IBRA subregion, the species is considered unlikely to occur and no further assessment is required. Additionally, in accordance with section 6.4.1.17 of the BAM, a candidate species credit species can be considered unlikely to occur within the subject land (or specific vegetation zones) where habitat is substantially degraded such that the species is unlikely to utilise area. As discussed in Sections 2 and 3, much of the vegetation within the subject land and 1,500 m buffer has been previously cleared, fragmented and is subject to ongoing disturbance.

A predicted candidate species credit species that is not considered to have suitable habitat on the subject land (or specific vegetation zones) in accordance with section 6.4.1.17 of the BAM does not require further assessment on the subject land (or specific vegetation zones). The reasons for determining that a predicted species credit species is unlikely to have suitable habitat on the subject land (or specific vegetation zones) has been included below for each Candidate Species for the BDAR.

Habitat and Geographic constraints for threatened species in Table 12.1 below were sourced from a variety of resources. Including each species profile published by the NSW Office of Environment & Heritage. (<https://www.environment.nsw.gov.au/threatenedspeciesapp/>).

All BAM-C predicated species were retained for in the BAM-C. A list of Predicted Ecosystem Credit Species is Provided in Appendix IV.

Table 12.1 - Potential Species Credit Species generated by the BAM-C, all the following species were candidate threatened species for the site.

| Scientific Name | Common Name | Habitat/ Geographic Constraints | Retained in BAM Calculator | Reason for Inclusion or Removal |
|-----------------------------|-------------------------|---|----------------------------|--|
| Flora | | | | |
| <i>Caladenia tessellata</i> | Thick Lip Spider Orchid | <p>The Thick Lip Spider Orchid is from a group of orchids characterised by five long spreading petals and sepals around a broad down-curved labellum ('lip'). It has cream-coloured petals with reddish stripes, and the yellowish labellum is broad with a few darker stripes. The long, sparsely-hairy, narrow leaf is about 6 cm long and 5 mm wide. Column base with two prominent yellow glands.</p> <p>Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).</p> <p>Within NSW, <i>Caladenia tessellata</i> is currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area.</p> <p>Areas of suitable habitat are not present within the site boundaries as the site has been significantly altered and degraded from its original state. The site would not be considered grassy sclerophyll woodland on clay loam or sandy soils. A dense coverage of exotic grasses is prohibiting growth of native vegetation. Further decreasing the chances of the species being present within the site boundaries.</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |

| | | | | |
|------------------------------|------------------------------|--|----|--|
| | | in the Wyong area on the Central Coast. The total population size is estimated to be less than 50 individuals. | | |
| <i>Gyrostemon thesioides</i> | <i>Gyrostemon thesioides</i> | Grows on hillsides and riverbanks and may be restricted to fine sandy soils. A fire-opportunist, with recruitment occurring from a soil stored seed bank following fire. Adult plants are killed by fire. Plants reach maturity in less than a year and plants are presumably short-lived. | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area.</p> <p>The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on-going disturbance. Nor are the soil profile requirements present on site.</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Persoonia hirsuta</i> | Hairy Geebung | Usually found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Habitat Preferences: It also favours disturbed heath, shrubby thickets and sandstone scrubs | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area.</p> <p>The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on-going disturbance. The soil profile requirements for the species are not present on site.</p> |

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| | | | | Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required. |
| <i>Camarophyllopsis kearneyi</i> | <i>Camarophyllopsis kearneyi</i> | <p>Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region.</p> <p>Its occurrence appears to be limited to the Lane Cove Bushland Park. Surveys in potentially suitable habitats elsewhere in the Sydney Basin Bioregion have failed to find <i>Camarophyllopsis kearneyi</i>.</p> <p>Does not produce basidiomes (above-ground fruiting structures) all year, but may be present only as non-reproductive hyphal structures below ground.</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to Lane Cove Bushland Park which is the only known population for the species.</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i> | <i>Hygrocybe anomala</i> var. <i>ianthinomarginata</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> |

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| | | <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.</p> | | <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Hygrocybe aurantipes</i> | <i>Hygrocybe aurantipes</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Hygrocybe austropratensis</i> | <i>Hygrocybe austropratensis</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to</p> |

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| | | <p>Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.</p> | | <p>Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Hygrocybe collucera</i> | <i>Hygrocybe collucera</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |

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| | | bodies begin appearing mid May to mid July sometimes to August. | | |
| <i>Hygrocybe griseoramosa</i> | <i>Hygrocybe griseoramosa</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Hygrocybe lanecovens</i> | <i>Hygrocybe lanecovens</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> |

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| | | <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.</p> | | <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Hygrocybe reesia</i> | <i>Hygrocybe reesia</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Hygrocybe rubronivea</i> | <i>Hygrocybe rubronivea</i> | <p>Occurs in gallery warm temperate forests dominated by Lilly Pilly (<i>Acmena smithii</i>), Grey Myrtle (<i>Backhousia myrtifolia</i>), Cheese</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. It is unlikely that the species would occur onsite as the site is not in or adjacent to</p> |

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| | | <p>Tree (<i>Glochidion ferdinandi</i>) and Sweet Pittosporum (<i>Pittosporum undulatum</i>).</p> <p>Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.</p> <p>Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.</p> <p>Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.</p> | | <p>Lane Cove Bushland Park. The site is not Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes</p> <p>Additionally, the species was not recorded during site surveys and no recording on Bionet within 10 Km radius. Species is not present and is unlikely to be present on the subject land. No further assessment required.</p> |
| <i>Rhodamnia rubescens</i> | Scrub Turpentine | <p>Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.</p> <p>This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.</p> | No | <p>Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area.</p> <p>The site has been significantly altered and degraded from its natural state. It has a long history of clearing, fragmentation and on-going disturbance. . No further assessment required.</p> |




| Scientific Name | Common Name | Habitat/ Geographic Constraints | Retained in BAM Calculator | Reason for Inclusion or Removal |
|----------------------------|----------------------|--|---------------------------------|---|
| Fauna | | | | |
| <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat | Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. | Yes – Further assessment | There is a moderate likelihood of occurrence for the species. There are Bionet recordings on site. The site presents habitat for the species in the form of foraging opportunities from eucalyptus and other flowering natives. Whilst no hollows recorded on site. Species utilise cracks and caves in cliff faces for roosting habitat. It is likely these features exist within 2km of the site, in particular along riparian corridors. Species retained in BAM. Species not recorded during site survey although assumed present. |
| <i>Lathamus discolor</i> | Swift Parrot | On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box ^. Commonly | Foraging – Yes Breeding - No | There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted threatened species (Ecosystem credits) in the BAM-C. The site presents marginal foraging habitat for the species in the form of canopy vegetation. |



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| | | used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . Return to home foraging sites on a cyclic basis depending on food availability. | | The development site does not contain areas of important breeding habitat for the species, as per the DPIE BV map. Habitat constraints in BAM-C are based on this BV map and as such, Habitat constraints are N/A. Species not recorded during site survey. No further assessment or consideration is required. |
| <i>Miniopterus australis</i> | Little Bent-winged Bat | Moist eucalypt forest, rainforest or dense coastal banksia scrub. Little Bentwing-bats roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Common Bentwing-bats (<i>M. schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young. | Foraging – Yes Breeding - No | There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted threatened species (Ecosystem credits) in the BAM-C. The site presents foraging habitat for the species. The development site would not be considered breeding habitat for the species. The impact area lacks key Habitat constraints including; Caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding, as per the BAM-C. No further assessment or consideration is required. |
| <i>Miniopterus orianae oceanensis</i> | Large Bent-winged Bat | Primarily roosts in caves but will utilise mine shafts, storm-water tunnels, buildings and other man-made structures. Forms colonies within a maternity cave and | Foraging – Yes Breeding - No | There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted |

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| | | disperse within a 300km range. Forage in forested areas in the tree canopy. | | <p>threatened species (Ecosystem credits) in the BAM-C. The site presents foraging habitat for the species.</p> <p>The development site would not be considered breeding habitat for the species. The impact area lacks key Habitat constraints including; Caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding, as per the BAM-C. No further assessment or consideration is required.</p> |
| <i>Anthochaera phrygia</i> | Regent Honeyeater | The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. This species has been seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests. | <p>Foraging – Yes</p> <p>Breeding - No</p> | <p>There is a moderate likelihood of occurrence. It is expected that the species may use the site for foraging and thus the species was retained as a Predicted threatened species (Ecosystem credits) in the BAM-C. The site presents marginal foraging habitat for the species in the form of canopy vegetation.</p> <p>The development site does not contain areas of important breeding habitat for the species, as per the DPIE BV map. Habitat constraints in BAM-C are based on this BV map and as such, Habitat constraints are N/A. Species not recorded during site survey. No further assessment or consideration is required.</p> |

Appendix II– Key Weed Removal Methods

Physical removal

| Technique | Method | Equipment |
|---|--|---|
| Hand Removal  | <p>Seedlings and smaller weed species where appropriate will be pulled out by hand, without risk of injury to workers. The size that this can occur varies throughout the treatment area. Generally, it ranges from post seed to approximately 300mm in height.</p> <p>Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked and stems and plants parts rolled. The clump of weed material can then be bagged and removed from site.</p> | <p>Tools: Gloves, Rakes, Knife and Weed Bags</p> |
| Crowning  | <p>Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning.</p> <p>A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an angle of approximately 45 degrees with surrounding soil, so as to cut any roots that may be running off. This is to occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and removed from the site and disposed of at an appropriate waste recycling facility</p> <p>Soil disturbance is to be kept to a minimum when using this technique.</p> | <p>Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E.</p> |
| Cut and Paint Stems  | <p>Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent or vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent.</p> <p>Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide applied via applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secateurs, loppers or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running off the stump.</p> <p>Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Herbicide is not to reach sediment or surrounding non-targeting plants.</p> | <p>Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide and all other required P.P.E.</p> |

| Technique | Method | Equipment |
|---|--|--|
| <p>Scrape and Painting</p>  | <p>More resilient weed species, where other techniques are less reliable are to be scraped with a knife or chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current herbicide license.</p> <p>Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide applied via applicator bottle. Scrape the trunk from as close to the ground as possible to approximately ¾ of the plants height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made on the other side of the trunk.</p> <p>Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.</p> <p>Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.</p> | <p>Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.</p> |
| <p>Cut with a Chainsaw and Paint</p>  | <p>Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a current chainsaw and herbicide license.</p> <p>Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via applicator bottle. Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upper branches to reduce bulk of plant.</p> <p>If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut again at the base and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and the translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be taken by the contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting plants.</p> <p>Follow up treatment will be required. If plants resprout, cut and paint the shoots using the same method.</p> | <p>Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.</p> |

| Technique | Method | Equipment |
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| Spot Spraying | <p>Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds once an area has been cleared or brushcut. Works to be carried out by a contractor with a current herbicide license.</p> <p>Herbicide will be mixed up according to the manufacturer's directions for the particular weed species being targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack sprayer. All care must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targeting plants.</p> | <p>Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E.</p> |

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.

While flame weeding is not suited to most streetscapes due to the fire hazard nor can it be used on materials such as soft fall and similar playground equipment it is noted that 'flame' weeding in waterways allows weed management in areas where herbicides are not permitted.

Also for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like Mother of Millions.

Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

FLAME WEEDER – ECO BURN

Case Study: Weed
Mgt and Eco-burn
Glenorie in the
Hills Shire Council



Images provided by Dragonfly
Environmental

Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding.



12.2 Appendix III– Bushland Hygiene Protocols for Phytophthora (Hornsby Council Recommendations)

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- And, always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits.

Contact Hornsby Bushcare if you require any refills or replacements of your Phytophthora Kits on 9484 3677 or bushcare@hornsby.nsw.gov.au

Facts about Phytophthora

Phytophthora cinnamomi (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement.

Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

Symptoms including Dieback

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as; changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

Initial symptoms of Phytophthora include; wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

12.3 Appendix IV– BAM –C; Reports and Data

Payment Repot.



Biodiversity payment summary report

| | | | |
|----------------------------------|----------------------|--|-----------------|
| Assessment Id | Payment data version | Assessment Revision | Report created |
| 00020950/BAAS19008/21/00028753 | | 0 | 20/10/2021 |
| Assessor Name | Assessor Number | Proposal Name | BAM Case Status |
| Geraldene Susan Dalby-Ball | BAAS19008 | Kurrajong Tallowood Stage 2 | Open |
| Assessment Type | Date Finalised | BOS entry trigger | |
| Part 4 Developments (Small Area) | To be finalised | BOS Threshold: Biodiversity Values Map and area clearing threshold | |

PCT list

| Price calculated | PCT common name | Credits |
|------------------|--|---------|
| Yes | 1281 - Sydney Turpentine - Ironbark forest | 13 |

Species list

| Price calculated | Species | Credits |
|------------------|---|---------|
| Yes | <i>Chalinolobus dwyeri</i> (Large-eared Pied Bat) | 16 |

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

| | | |
|--------------------------------|-----------------------------|-------------|
| Assessment Id | Proposal Name | Page 1 of 3 |
| 00020950/BAAS19008/21/00028753 | Kurrajong Tallowood Stage 2 | |



Biodiversity payment summary report

| IBRA sub region | PCT common name | Threat status | Offset trading group | Risk premium | Administrative cost | Methodology adjustment factor | Price per credit | No. of ecosystem credits | Final credits price |
|-------------------------------------|---|---------------|---|--------------|---------------------|-------------------------------|------------------|--------------------------|---------------------|
| Cumberland | 1281 - Sydney Turpentine - Ironbark forest | Yes | Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion | 18.83% | \$302.25 | 1.7832 | \$9,281.37 | 13 | \$120,657.82 |
| Subtotal (excl. GST) | | | | | | | | | \$120,657.82 |
| GST | | | | | | | | | \$12,065.78 |
| Total ecosystem credits (incl. GST) | | | | | | | | | \$132,723.60 |

Species credits for threatened species

| Species profile ID | Species | Threat status | Price per credit | Risk premium | Administrative cost | No. of species credits | Final credits price |
|----------------------|--|---------------|------------------|--------------|---------------------|------------------------|---------------------|
| 10157 | <i>Chalinolobus dwyeri</i> (Large-eared Pied Bat) | Vulnerable | \$741.31 | 20.6900% | \$80.00 | 16 | \$15,594.99 |
| Subtotal (excl. GST) | | | | | | | \$15,594.99 |
| GST | | | | | | | \$1,559.50 |

Assessment Id
00020950/BAAS19008/21/00028753

Proposal Name
Kurrajong Tallowood Stage 2

Page 2 of 3



Biodiversity payment summary report

| | | |
|-----------------------------------|--|--------------|
| Total species credits (incl. GST) | | \$17,154.49 |
| Grand total | | \$149,878.09 |

| | | |
|--------------------------------|-----------------------------|-------------|
| Assessment Id | Proposal Name | Page 3 of 3 |
| 00020950/BAAS19008/21/00028753 | Kurrajong Tallowood Stage 2 | |

Credit Summary Repot.



BAM Credit Summary Report

Proposal Details

| | | |
|--------------------------------|----------------------------------|--|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00020950/BAAS19008/21/00028753 | Kurrajong Tallowood Stage 2 | 10/06/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Geraldene Susan Dalby-Ball | 20/10/2021 | 45 |
| Assessor Number | BAM Case Status | Date Finalised |
| BAAS19008 | Open | To be finalised |
| Assessment Revision | Assessment Type | BOS entry trigger |
| 0 | Part 4 Developments (Small Area) | BOS Threshold: Biodiversity Values Map and area clearing threshold |

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

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

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

Assessment Id
00020950/BAAS19008/21/00028753

Proposal Name
Kurrajong Tallowood Stage 2

Page 1 of 2



BAM Credit Summary Report

| Sydney Turpentine - Ironbark forest | | | | | | | | | | | |
|-------------------------------------|-----------|---|------|------|------|--|-----------------------|------------------------------------|------|----------|----|
| 1 | 1281_Poor | Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion | 51.6 | 21.6 | 0.98 | Critically Endangered Ecological Community | Critically Endangered | High Sensitivity to Potential Gain | 2.50 | TRUE | 13 |
| | | | | | | | | | | Subtotal | 13 |
| | | | | | | | | | | Total | 13 |

Species credits for threatened species

| Vegetation zone name | Habitat condition (Vegetation Integrity) | Change in habitat condition | Area (ha)/Count (no. individuals) | BC Act Listing status | EPBC Act listing status | Biodiversity risk weighting | Potential SAI | Species credits |
|--|--|-----------------------------|-----------------------------------|-----------------------|-------------------------|-----------------------------|---------------|-----------------|
| Chalinolobus dwyeri / Large-eared Pied Bat (Fauna) | | | | | | | | |
| 1281_Poor | 21.6 | 21.6 | 0.96 | Vulnerable | Vulnerable | 3 | True | 16 |
| | | | | | | | Subtotal | 16 |

Assessment Id
00020950/BAAS19008/21/00028753

Proposal Name
Kurrajong Tallowood Stage 2

Page 2 of 2

Predicted species repot.



BAM Predicted Species Report

Proposal Details

| | | |
|--------------------------------|---|-------------------------|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00020950/BAAS19008/21/00028753 | Kurrajong Tallowood Stage 2 | 10/06/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Geraldene Susan Dalby-Ball | 20/10/2021 | 45 |
| Assessor Number | Assessment Type | BAM Case Status |
| BAAS19008 | Part 4 Developments (Small Area) | Open |
| Assessment Revision | BOS entry trigger | Date Finalised |
| 0 | BOS Threshold: Biodiversity Values Map and area clearing threshold | 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.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

| Common Name | Scientific Name | Vegetation Types(s) |
|---|---------------------------------|--|
| Barking Owl | Ninox connivens | 1281-Sydney Turpentine - Ironbark forest |
| Black-chinned Honeyeater (eastern subspecies) | Melithreptus gularis gularis | 1281-Sydney Turpentine - Ironbark forest |
| Dusky Woodswallow | Artamus cyanopterus cyanopterus | 1281-Sydney Turpentine - Ironbark forest |
| Eastern Coastal Free-tailed Bat | Micronomus norfolkensis | 1281-Sydney Turpentine - Ironbark forest |
| Flame Robin | Petroica phoenicea | 1281-Sydney Turpentine - Ironbark forest |
| Gang-gang Cockatoo | Callocephalon fimbriatum | 1281-Sydney Turpentine - Ironbark forest |
| Glossy Black-Cockatoo | Calyptorhynchus lathami | 1281-Sydney Turpentine - Ironbark forest |
| Grey-headed Flying-fox | Pteropus poliocephalus | 1281-Sydney Turpentine - Ironbark forest |
| Hooded Robin (south-eastern form) | Melanodryas cucullata cucullata | 1281-Sydney Turpentine - Ironbark forest |
| Koala | Phascolarctos cinereus | 1281-Sydney Turpentine - Ironbark forest |

| | | |
|--------------------------------|-----------------------------|-------------|
| Assessment Id | Proposal Name | Page 1 of 2 |
| 00020950/BAAS19008/21/00028753 | Kurrajong Tallowood Stage 2 | |



BAM Predicted Species Report

| | | |
|--------------------------------|--------------------------------|--|
| Large Bent-winged Bat | Miniopterus orianae oceanensis | 1281-Sydney Turpentine - Ironbark forest |
| Little Bent-winged Bat | Miniopterus australis | 1281-Sydney Turpentine - Ironbark forest |
| Little Eagle | Hieraaetus morphnoides | 1281-Sydney Turpentine - Ironbark forest |
| Little Lorikeet | Glossopsitta pusilla | 1281-Sydney Turpentine - Ironbark forest |
| Masked Owl | Tyto novaehollandiae | 1281-Sydney Turpentine - Ironbark forest |
| New Holland Mouse | Pseudomys novaehollandiae | 1281-Sydney Turpentine - Ironbark forest |
| Painted Honeyeater | Grantiella picta | 1281-Sydney Turpentine - Ironbark forest |
| Powerful Owl | Ninox strenua | 1281-Sydney Turpentine - Ironbark forest |
| Regent Honeyeater | Anthochaera phrygia | 1281-Sydney Turpentine - Ironbark forest |
| Rosenberg's Goanna | Varanus rosenbergi | 1281-Sydney Turpentine - Ironbark forest |
| Scarlet Robin | Petroica boodang | 1281-Sydney Turpentine - Ironbark forest |
| Speckled Warbler | Chthonicola sagittata | 1281-Sydney Turpentine - Ironbark forest |
| Spotted-tailed Quoll | Dasyurus maculatus | 1281-Sydney Turpentine - Ironbark forest |
| Square-tailed Kite | Lophoictinia isura | 1281-Sydney Turpentine - Ironbark forest |
| Swift Parrot | Lathamus discolor | 1281-Sydney Turpentine - Ironbark forest |
| Turquoise Parrot | Neophema pulchella | 1281-Sydney Turpentine - Ironbark forest |
| Varied Sittella | Daphoenositta chrysoptera | 1281-Sydney Turpentine - Ironbark forest |
| White-throated Needletail | Hirundapus caudacutus | 1281-Sydney Turpentine - Ironbark forest |
| Yellow-bellied Sheath-tail-bat | Saccolaimus flaviventris | 1281-Sydney Turpentine - Ironbark forest |

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

| Common Name | Scientific Name | Justification in the BAM-C |
|-------------|-----------------|----------------------------|
|-------------|-----------------|----------------------------|

Candidate species report.



BAM Candidate Species Report

Proposal Details

| | | |
|--------------------------------|----------------------------------|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00020950/BAA519008/21/00028753 | Kurrajong Tallowood Stage 2 | 10/06/2021 |
| Assessor Name | Report Created | BAM Data version * |
| Geraldene Susan Dalby-Ball | 20/10/2021 | 45 |
| Assessor Number | Assessment Type | BAM Case Status |
| BAA519008 | Part 4 Developments (Small Area) | Open |
| Assessment Revision | Date Finalised | BOS entry trigger |
| 0 | To be finalised | BOS Threshold: Biodiversity Values Map and area clearing threshold |

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

List of Species Requiring Survey

| Name | Presence | Survey Months |
|---|-----------------------|---|
| <i>Chalinolobus dwyeri</i> Large-eared Pied Bat | Yes (assumed present) | <input checked="" type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input type="checkbox"/> May <input type="checkbox"/> Jun <input type="checkbox"/> Jul <input type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input checked="" type="checkbox"/> Nov <input checked="" type="checkbox"/> Dec <input type="checkbox"/> Survey month outside the specified months? |

Threatened species assessed as not on site

Refer to BAR for detailed justification

| Common name | Scientific name | Justification in the BAM-C |
|--|--|----------------------------|
| Camarophyllopsis kearneyi | Camarophyllopsis kearneyi | Habitat degraded |
| Gyrostemon thesioides | Gyrostemon thesioides | Habitat degraded |
| Hairy Geebung | Persoonia hirsuta | Habitat degraded |
| Hygrocybe anomala var. ianthinomarginata | Hygrocybe anomala var. ianthinomarginata | Habitat degraded |

| | | |
|--------------------------------|-----------------------------|-------------|
| Assessment Id | Proposal Name | Page 1 of 2 |
| 00020950/BAA519008/21/00028753 | Kurrajong Tallowood Stage 2 | |



BAM Candidate Species Report

| | | |
|---------------------------|-------------------------------|---------------------|
| Hygrocybe aurantipes | Hygrocybe aurantipes | Habitat degraded |
| Hygrocybe austropratensis | Hygrocybe austropratensis | Habitat degraded |
| Hygrocybe collucera | Hygrocybe collucera | Habitat degraded |
| Hygrocybe griseoramosa | Hygrocybe griseoramosa | Habitat degraded |
| Hygrocybe lanecovens | Hygrocybe lanecovens | Habitat degraded |
| Hygrocybe reesia | Hygrocybe reesia | Habitat degraded |
| Hygrocybe rubronivea | Hygrocybe rubronivea | Habitat degraded |
| Large Bent-winged Bat | Miniopterus oriana oceanensis | Habitat constraints |
| Little Bent-winged Bat | Miniopterus australis | Refer to BAR |
| Regent Honeyeater | Anthochaera phrygia | Habitat degraded |
| Scrub Turpentine | Rhodamnia rubescens | Habitat degraded |
| Swift Parrot | Lathamus discolor | Habitat constraints |
| Thick Lip Spider Orchid | Caladenia tessellata | Habitat degraded |

Biodiversity Credit Report (Like for Like).



BAM Biodiversity Credit Report (Like for like)

Proposal Details

| | | |
|--|---|-------------------------|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00020950/BAAS19008/21/00028753 | Kurrajong Tallowood Stage 2 | 10/06/2021 |
| Assessor Name | Assessor Number | BAM Data version * |
| Geraldene Susan Dalby-Ball | BAAS19008 | 45 |
| Proponent Names | Report Created | BAM Case Status |
| | 20/10/2021 | Open |
| Assessment Revision | Assessment Type | Date Finalised |
| 0 | Part 4 Developments (Small Area) | To be finalised |
| BOS entry trigger | * 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. | |
| BOS Threshold: Biodiversity Values Map and area clearing threshold | | |

Potential Serious and Irreversible Impacts

| Name of threatened ecological community | Listing status | Name of Plant Community Type/ID |
|---|--|--|
| Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion | Critically Endangered Ecological Community | 1281-Sydney Turpentine - Ironbark forest |
| Species | | |
| Chalinolobus dwyeri / Large-eared Pied Bat | | |

| | | |
|--------------------------------|-----------------------------|-------------|
| Assessment Id | Proposal Name | Page 1 of 3 |
| 00020950/BAAS19008/21/00028753 | Kurrajong Tallowood Stage 2 | |



BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCTs With Customized Benchmarks

| PCT |
|------------|
| No Changes |

Predicted Threatened Species Not On Site

| Name |
|------------|
| 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 | HBT Cr | No HBT Cr | Total credits to be retired |
|--|---|----------------|--------|-----------|-----------------------------|
| 1281-Sydney Turpentine - Ironbark forest | Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion | 1.0 | 0 | 13 | 13 |

| 1281-Sydney Turpentine - Ironbark forest | Like-for-like credit retirement options | | | | | |
|--|--|---------------|-----------|-----|---------|---|
| | Name of offset trading group | Trading group | Zone | HBT | Credits | IBRA region |
| | Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion This includes PCT's: 1183, 1281, 1284 | - | 1281_Poor | No | 13 | 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. |

Assessment Id

00020950/BAA519008/21/00028753

Proposal Name

Kurrajong Tallwood Stage 2

Page 2 of 3



BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

| Species | Vegetation Zone/s | Area / Count | Credits |
|---|-------------------|--------------|---------|
| Chalinolobus dwyeri / Large-eared Pied Bat | 1281_Poor | 1.0 | 16.00 |

Credit Retirement Options

Like-for-like credit retirement options

| Chalinolobus dwyeri / Large-eared Pied Bat | Spp | IBRA subregion |
|--|---|----------------|
| | Chalinolobus dwyeri / Large-eared Pied Bat | Any in NSW |

Assessment Id

00020950/BAAS19008/21/00028753

Proposal Name

Kurrajong Tallowood Stage 2

Page 3 of 3

12.4 Appendix V – Species Polygon

The field survey revealed a highly-disturbed site. The vegetation which runs adjacent to Old Bells Line of Road appears to have the highest vegetation integrity as seen with a current vegetation integrity score of 51.6. Canopy over across the site is discontinuous. The mid stratum is primarily absent within site boundaries. The ground stratum has been highly disturbed, with much of the site dominated 'High Threat Exotic' (HTE) species. Most of the site is currently being maintained as pasture grass for livestock. The species polygon covers the "suitable habitat area" and includes all of vegetation in zone one and native planted vegetation. Species credits generated in this BDAR were generated in the Asset Protection Zone (APZ). The activities within the APZ area are not expected to significantly degrade or remove breeding habitat features as they currently do not exist within the site. The vegetation modification will impact the habitat suitability for the candidate species Large-eared Pied Bat. Removal of canopy cover and the remaining midstrata vegetation is likely to reduce the insect abundance within this zone, subsequently impacting the potential foraging habitat for the Large-eared Pied Bat. The impacts to the potential habitat for Large-eared Pied Bat (*Chalinolobus dwyeri*) were calculated as a loss of -21.6 for and area of 0.96 ha, resulting in 16 Species Credits.

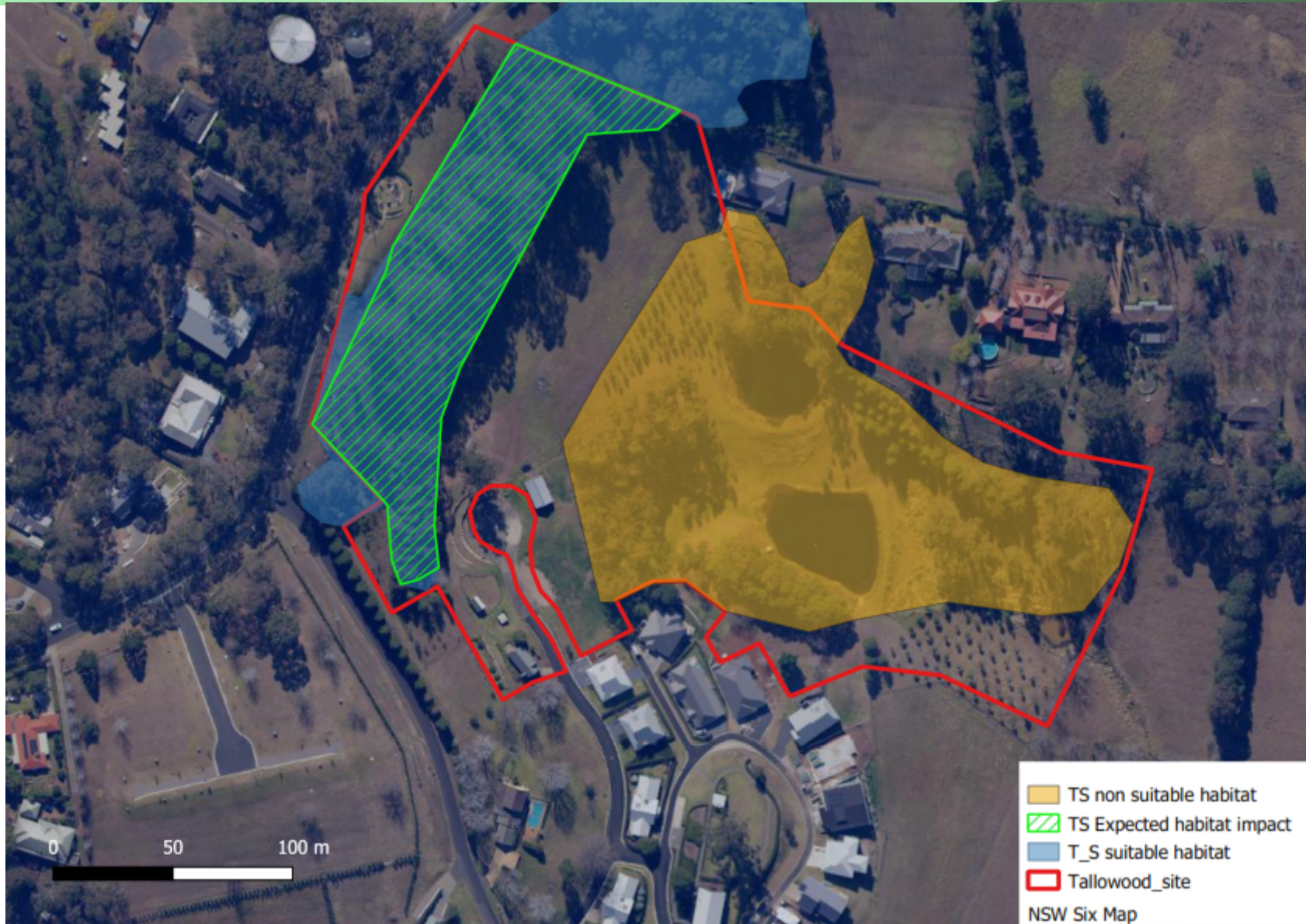


Figure 12.2 - The species polygon below is appropriate for the species credit species generated in this BDAR.

12.5 Appendix VI – BAM Plot Field

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form *L6 Rd side* Site Sheet no: *1 of 2*

| | | | | | | | |
|----------------------|----------------|-------------|---------------------|--------------------------|------------------|-----------|-----------------|
| Date | <i>16/6/20</i> | Survey Name | <i>Kurrajong L6</i> | Zone ID | | Recorders | <i>GPB MDSO</i> |
| Zone | Datum | Plot ID | <i>L6 1</i> | Plot dimensions | <i>20m x 20m</i> | Photo # | |
| Easting | Northing | IBRA region | <i>Sydney</i> | Midline bearing from 0 m | | Magnetic | |
| Vegetation Class | | | | Confidence: H M L | | | |
| Plant Community Type | | | | Confidence: H M L | | | |

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

| BAM Attribute (400 m ² plot) | | Sum values |
|---|--------------|------------|
| Count of Native Richness | Trees | |
| | Shrubs | |
| | Grasses etc. | |
| | Forbs | |
| | Ferns | |
| | Other | |
| Sum of Cover of native vascular plants by growth form group | Trees | |
| | Shrubs | |
| | Grasses etc. | |
| | Forbs | |
| | Ferns | |
| | Other | |
| High Threat Weed cover | | |

| BAM Attribute (1000 m ² plot) | | |
|--|--|-------------------------|
| DBH | # Tree Stems Count | # Stems with Hollows |
| 80 + cm | <i> </i> | <i>1</i> |
| 50 – 79 cm | <i> </i> | |
| 30 – 49 cm | <i> </i> | <i>1</i> |
| 20 – 29 cm | <i> </i> <i> </i> <i> </i> | |
| 10 – 19 cm | <i> </i> <i> </i> <i> </i> | |
| 5 – 9 cm | <i> </i> | |
| < 5 cm | <i>1</i> | n/a |
| Length of logs (m) (≥10 cm diameter, >50 cm in length) | | <i>0.8m</i> Tally space |

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

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

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | Bare ground cover (%) | Cryptogam cover (%) | Rock cover (%) |
|-------------------------------|-----------------------|-----------------------|---------------------|------------------|
| Subplot score (% in each) | <i>70 65 80 80 50</i> | <i>2 2 2 1 1</i> | <i>2 1 1 1 1</i> | <i>0 0 0 0 0</i> |
| Average of the 5 subplots | | | | |

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

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

| | | | | | | |
|--------------------|----------------------|---------------------|------------------|-------------------|------------------------------------|------------|
| Morphological Type | Landform Element | <i>slope off rd</i> | Landform Pattern | | Microrelief | <i>Yes</i> |
| Lithology | Soil Surface Texture | <i>loose moist</i> | Soil Colour | <i>dark brown</i> | Soil Depth | |
| Slope | Aspect | <i>East</i> | Site Drainage | <i>down slope</i> | Distance to nearest water and type | |

| Plot Disturbance | Severity code | Age code | Observational evidence: |
|---------------------------------|---------------|-----------|---|
| Clearing (inc. logging) | <i>3</i> | <i>0</i> | <i>Canopy Planted.</i> |
| Cultivation (inc. pasture) | | | <i>All regrowth and 90% of trees are planted.</i> |
| Soil erosion | | | <i>Ben under scrubbed in upst. Rest of slope = weeds</i> |
| Firewood / CWD removal | | <i>0</i> | <i>70% weeds on the slope. And in best location</i> |
| Grazing (identify native stock) | | <i>0</i> | <i>Horses not on this slope though</i> |
| Fire damage | | | |
| Storm damage | | | |
| Weediness | <i>2-3</i> | <i>NR</i> | <i>Moderate to will get worse with no action. Most of slope to weed dense to survey. Area of slope x 20m = ok</i> |
| Other | | | <i>to survey and rest is dense weed.</i> |

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe
 Age: R=recent (<3yrs), NR=not recent (3-10yrs), 0=old (>10yrs)

2 for most of this veg and ok.

Plate 2a. BAM-C Field sheet one NB: BAM Attributes done in office so not on field sheet..

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

2 of 2

400 m² plot: Sheet 6 of 20

Survey Name: Kurrajong Plot Identifier: Lb 1 Recorders: CWB MOB

Date: 16/12/20

| GF Code | Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable | N, E or HTE | Cover | Abund | stratum | voucher |
|---------|---|-------------|-------|-------|---------|---------|
| 1 | <i>Eucalyptus tereticornis</i> (planted) Red | N | 50 | | C | |
| 2 | <i>Eucalyptus eugenioides</i> (planted) Stringy | N | 10 | | C | |
| 3 | <i>Echidna grass</i> <i>Echinopogon</i> | N | <5 | 20+ | G | |
| 4 | <i>Oxalis perennans</i> | N | 1 | 20+ | | |
| 5 | <i>Pratia purpureascens</i> | N | 1 | 20+ | | |
| 6 | <i>Cenchrus ciliaris</i> | N | 1 | 50+ | | |
| 7 | <i>Glycine clandestina</i> | N | 1 | 5+ | | |
| 8 | <i>Lomandra longifolia</i> | N | 2 | 20+ | | |
| 9 | <i>Dianella caerulea</i> | N | 2 | 50+ | | |
| 10 | <i>Gahania aspera</i> | N | 1 | 5 | | |
| 11 | <i>Centella asiatica</i> | N | 2 | 50+ | | |
| 12 | <i>Acacia</i> sp? | N | 1 | 6 | | |
| 13 | <i>Smilax</i> | N | 1 | 20 | | |
| 14 | <i>Pittosporum revoluta</i> (planted?) | N | 1 | 5 | | |
| 15 | <i>Cayratia clematidea</i> Native Grape | N | <1 | 4 | | |
| 16 | <i>Sigesbeckia</i> | N | <1 | 3 | | |
| 17 | <i>Leptochloa latens</i> | N | <1 | 1 | | |
| 18 | <i>Cheilanthes sieberi</i> sub <i>sieberi</i> | N | <1 | 10 | | |
| 19 | Native Raspberry | N | <1 | 2 | | |
| 20 | <i>Entolasia marginata</i> | N | 1 | 400 | | |
| 21 | | | | | | |
| 22 | | | | | | |
| 23 | Exotics | | | | | |
| 24 | Black berry | HTE | 3 | 20 | | |
| 25 | Bridal Creeper | E | <1 | 2 | | |
| 26 | <i>Bidens</i> | E | 10 | 500+ | | |
| 27 | Road Grass | E | 5 | 500+ | | |
| 28 | Kikuyu Grass | E | 15 | 1000+ | | |
| 29 | <i>Ehretia</i> Grass | E | 5 | 1000+ | | |
| 30 | Lantana | | 5 | 100 | | |
| 31 | Large leaf Privet | | 2 | 10 | | |
| 32 | Small leaf Privet | | 2 | 100 | | |
| 33 | Ochra | E | 2 | 50 | | |
| 34 | Moth vine | | 1 | 3 | | |
| 35 | Vetch | E | 1 | 20 | | |
| 36 | Pigeon Grass | E | 0.2 | 200 | | |
| 37 | Moth Vine | E | 1 | + | | |
| 38 | | | | | | |
| 39 | Outside Transit <i>Leucopogon juniperinum</i> | | | | 1 | |
| 40 | | | | | | |

GF Code: see Growth Form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF - circle code if 'top 3'

Plate 2b. BAM-C Field sheet two.

| Species List | Growth Code | Cover |
|-------------------------|-------------|--------------|
| Eucalyptus tereticornis | Tree (TG) | 50 |
| Eucalyptus euginodios | Tree (TG) | 10 |
| Entolasia Marginata | grass | 1 |
| Lomandra Longifolia | grass | 2 |
| Gahnia aspera | grass | 1 |
| Einadia hastata | Forb (FG) | 5 |
| Oxalis perennans | Forb (FG) | 1 |
| Pratia purpurascens | Forb (FG) | 1 |
| Commelina cyanea | Forb (FG) | 1 |
| Centella asiatica | Forb (FG) | 2 |
| Sigesbeckia | Forb (FG) | 1 |
| Dianella caerulea | Forb (FG) | 2 |
| Glycine clandestina | Other (OG) | 1 |
| Smilax | Other (OG) | 1 |
| Cayratia clematidea | Other (OG) | 1 |
| Acacia sp | Shrub | 1 |
| Pittosporum revolutum | Shrub | 1 |
| Leptospermum | Shrub | 1 |
| Rubus probus | Shrub | 1 |
| Cheilanthes sieberi | Fern | 1 |
| | | |
| | | |
| | | |
| Total | # | Cover |
| Tree (TG) | 2 | 60 |
| Shrub (SG) | 4 | 4 |
| Forb (FG) | 7 | 13 |
| Grass & grasslike (GG) | 3 | 4 |
| Fern (EG) | 1 | 1 |
| Other (OG) | 3 | 3 |

| Weeds (THE) | Cover |
|--|-----------|
| Black Berry Vine - Rubus fruticosus | 3 |
| Bridal creeper (Asparagus asparagoides) | 1 |
| Bidens spp | 10 |
| Rhodes grass (Chloris gayana | 5 |
| Kikuyu (Cenchrus clandestinus) | 15 |
| Erharata erecta | 5 |
| Lantanan sp | 5 |
| Sml Privet | 2 |
| Large privet | 2 |
| Ochna | 2 |
| Moth vine (Araujia sericifera) | 2 |
| vetch (Vicia sativa | 2 |
| Purple pigeon grass (Setaria incrassata) | |
| | |
| total | 52 |

Figure 12.4 - BAM-C Data import template.

13 Expertise of authors

With over 20 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Geraldene a valuable contribution to any project.

Geraldene has over 8 years local government experience as manager of environment and education for Pittwater Council. Geraldene presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Geraldene is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Geraldene has up to date knowledge of environmental policies and frequently provides input to such works. Geraldene was a key contributor to the recent set of Guidelines commissioned by South East Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Geraldene's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Geraldene is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Geraldene is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Geraldene's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Geraldene is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

Geraldene Dalby-Ball DIRECTOR



SPECIALISATIONS

- Urban Ecology – and habitat rehabilitation and re-creation.
- Urban waterway management – assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration – assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor – environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- Director and Ecologist**, Ecological Consultants Australia. 2014-*present*
- Director and Ecologist**, Dragonfly Environmental. 1998-*present*
- Manager** Natural Resources and Education, Pittwater Council 2002-2010
- Wetland Ecologist** Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- Bachelor of Science with 1st Class Honors**, Sydney University
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Senior First Aid Certificate.
- Practicing member and vice president** Ecological Consultants Association of NSW

Jack is a passionate ecologist who has worked with various stakeholders across both the public and private sectors to deliver sustainable environmental outcomes. He has worked on projects with major construction contractors and has been able to deliver tailored environmental solutions on time and within budget.

As an undergraduate student, he published a study that examined the cost of revegetation across the Richmond River Catchment in NSW. This study provided Jack with a deep understanding of urban and landscape ecology and the environmental factors associated with habitat restoration.

He has advanced communication skills and can deliver professional ecological assessments. He has a thorough understanding of current NSW and Commonwealth environmental legislation. He is also competent in the practical application of flora and fauna surveying and monitoring techniques.

Jack would be a valuable addition to any ecology project as he is committed to achieving the best possible outcome for both the client and the environment.

Key Projects Include:

- Monitoring of Endangered Species, various locations
- Environmental consultant for many civil developments throughout the Sydney region
- Researching the On-farm costs of revegetation in the Richmond River Catchment
- Sustainable business transformation proposal for a retail store.

Jack Hastings

ECOLOGIST

SPECIALISATIONS

- Urban and landscape ecology – design and re-creation
- Environmental Impact Assessments (EIA)
- Review of Environmental Factors for development applications
- Flora and Fauna management plans
- Habitat tree assessment, marking and mapping
- GIS mapping
- Sound understanding and practical application of experimental design
- Grant writing and grant assessment

CAREER SUMMARY

- **Ecologist**, Ecological Consultants Australia. *2019-present*
- **Environmental Consultant**, BBN Consulting. *2018-2019*

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Environmental Science**, Southern Cross University.
- **Certificate II Agriculture.**
- **WHS General Induction of Construction Industry NSW White Card.**

Luke is a passionate ecologist who has experience across both the government and private sectors to deliver sustainable environmental outcomes. He has contributed to projects with major construction contractors and has been able to deliver creative environmental solutions on time and within budget.

Luke's passion for fauna was discovered through volunteer work handling microbats in Victoria. Those skills have been honed through the work with ECA as a fauna spotter during vegetation clearing activities in NSW.

As an undergraduate student, he interned with the Bureau of Meteorology to conduct research identifying traditional ecological knowledge of severe weather events in communities in the Pacific.

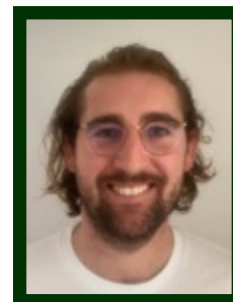
He has exceptional customer communication skills and builds long lasting professional relationships with his clients. He has a working knowledge of current NSW and Commonwealth environmental legislation. He is also competent in the practical application of flora and fauna surveying and monitoring techniques.

Key Projects Include:

- Monitoring of Endangered Species, various locations of NSW and VIC
- Fauna spotter during vegetation clearing
- Conducted environmental impact assessments for state infrastructure projects and Department of Defence
- Passion for traditional ecological knowledge including researching for the Bureau of Meteorology's COSPAC program

Luke Johnson

ECOLOGIST



SPECIALISATIONS

- Urban and landscape ecology
- Environmental Impact Assessments (EIA)
- Flora and Fauna Assessments
- Habitat tree assessment, marking and mapping
- GIS mapping
- Fauna spotting

CAREER SUMMARY

- **Ecologist**, Ecological Consultants Australia. 2020-present
- **Environmental Consultant**, Hibbs & Associates. 2019-2020
- **Field Ecologist**, Biosis 2018-2019
- **Volunteer**, Microbat box monitoring and handling including assisting in tagging

QUALIFICATIONS AND MEMBERSHIPS

- Bachelor of Environmental Management and Ecology, Victoria University
- First aid certificate
- Asbestos awareness training
- WHS General Induction of Construction Industry NSW White Card