Biodiversity Development Assessment Report

PLC's Grey House Precinct - 20 Avon Rd, Pymble NSW 2073

By Ecological Consultants Australia Pty Ltd TA
Kingfisher Urban Ecology and Wetlands

Updated June 2022

About this document

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Statement of Authorship

This study and report was undertaken by Ecological Consultants Australia at Studio 1/33 Avalon Parade, Avalon. The author of the report is Geraldene Dalby-Ball with qualifications BSc. majoring in Ecology and Botany with over 20 years' experience in this field and Luke Johnson with qualifications B EnvSc.

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 Kate Bimson of Pymble Ladies' College to provide a **Biodiversity Development Assessment Report** for a proposal at Grey House Precinct – 20 Avon Road, Pymble NSW 2073 within the Ku-ring-gai Council Local Government Area (LGA).

Trigger for a formal BDAR under the BC Act 2016:
Under Part 7 (s7.9), Biodiversity assessment for State significant development or infrastructure.

Stage 1: Biodiversity Assessment

- On-ground survey took place in September 2021 by Ecologist Luke Johnson.
- Data was gathered across two BAM plots located in each vegetation zone at the site.
- 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 0.06ha within the 0.65ha site.
- Survey plot 1 was within the planted garden vegetation located within the development footprint and assessed as vegetation community Sydney Turpentine-Ironbark Forest STIF (PCT1281).
- Survey plot 2 was within the proposed site accessway and assessed as vegetation community 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.
- No threatened species were recorded during the site surveys.

Mitigation Measures

- 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 0.06ha on Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). This vegetation has been significantly altered and degraded from its natural state.
- The site has been managed as the Pymble Ladies College since the 1916. The site has a long history of vegetation clearing, habitat fragmentation and on-going disturbance, via development. A

majority of vegetation on site is regrowth or has been planted by the school. There is little to no remnant vegetation left within the site.

- The grand total cost to offset both ecosystem credits and species credits generated by this development is $21,491.16 (including GST), assuming payment will be made into the Biodiversity Conservation Fund.
- 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.

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Stage 1: Biodiversity Assessment

1 Introduction

Ecological Consultants Australia (ECA) has been contracted by Kate Bimson of Pymble Ladies' College to provide a **Biodiversity Development Assessment Report** for a proposal at Grey House Precinct – 20 Avon Road, Pymble NSW 2073 within the Ku-ring-gai Local Government Area (LGA).

1.1 Site information and general description

The Subject Site (the "Site") is the area of direct and likely indirect impacts and is defined as the whole of the proposed future Grey House Precinct.
This area has been assessed in the Biodiversity Assessment Method Calculator (BAM-C) from which offset credits have been generated.

Table 1.1 - Site Administrative Information

Category	Details
Title Reference (Lot/DP)	1/-/DP69541
Total Site Area (ha)	0.65 ha
Street Address	20 Avon Road, Pymble NSW 2073
LGA	Ku-ring-gai Council
Land Zoning	SP2: Infrastructure

Figure 1.1 Aerial – Pymble Ladies College (red) and surrounds.

Figure 1.2 Site Location of the future Grey House Precinct and accessway vegetation. Image source: SixMaps 2021

1.2 Site history

The site has been managed as grounds of the Pymble Ladies College since the 1916. Native vegetation would have once covered the area although ongoing modification and disturbance has resulted in the site no longer retaining many natural attributes (see figure 1.3a). 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 development within the school grounds.

The vegetation on site consist of cleared open space with garden landscaped areas. A mix of exotic and native canopy species are scattered throughout. Arboriculture assessment report (Arborsafe, 2021) determines that a number of the mature native trees within the site are likely to have been planted. However, due to the age and structure some individuals within Vegetation Zone 2 (accessway) are expected to be remnant and form part of the original vegetation community. Historical aerials have been provided below. Aerials show vegetation – yes it may have been cleared (sure it would have been as Blue Gum and Turpentine are some of the most valuable of trees in this area. Often trees were able to re-grow when safe within an estate (personal, government, school, cemetery etc). In this case the trees around the edges are dispersed in a way that indicates regeneration, Also that the area that is not Pymble Golf Course – this area too has the same canopy mix. Mapping of these two PCTs matches the canopy species on site. The soil type matches the PCT. Blue Gums and Turpentines have been planted on the site. Those that have been obviously planted are present in the open areas along pathways. These were not considered as remnant. Exotic species are dominant across the site and current management practices are preventing the recovery of the original plant community.

Figure 1.3a Historical imagery of Pymble Ladies College 1943. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.

Figure 1.3b Historical imagery of Pymble Ladies College 1970. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.

Figure 1.3c Historical imagery of Pymble Ladies College 1982. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.

Figure 1.3d Historical imagery of Pymble Ladies College 1994. Source: NSW Government, 2020 Spatial Collaboration Portal, Accessed 2022.

1.3 Proposed actions

The proposed development include:

- Demolition of existing buildings (single story demountable).
- Vegetation removal within the proposed building footprint (see figure 1.5)
- Construction of a new building (dotted outline in figure 1.4).
- Integrated open space and landscaping to provide outdoor learning and support well-being.
- Proposed construction access is located along an existing paved footpath. The accessway requires a minimum 4m width and this results in 4 trees requiring removal and minor canopy trimming.

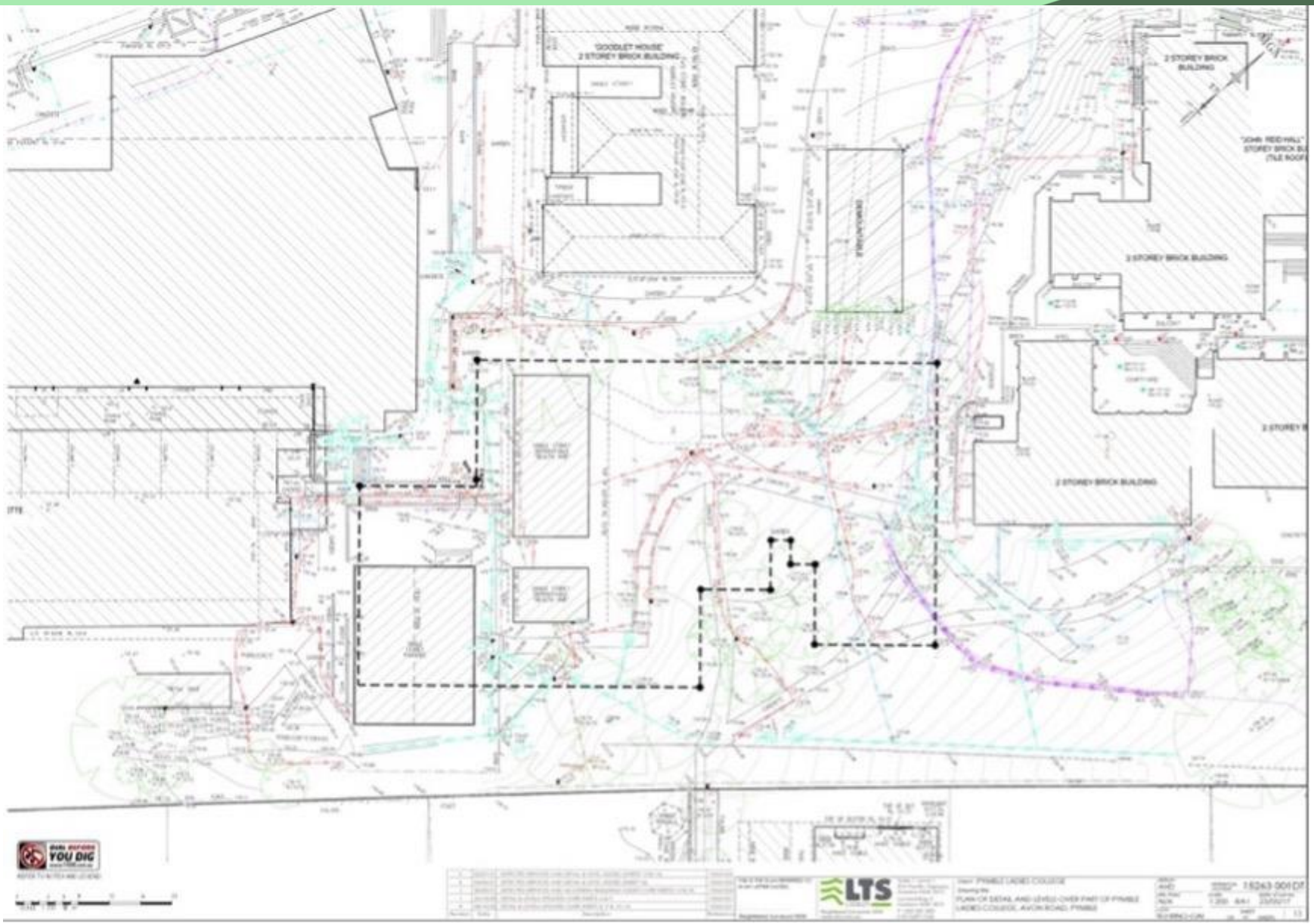


Figure 1.4. Plan of Detail and Levels over part of PLC, Avon Rd, Pymble. Source: LTS Lockley 03/07/21 Rev K.

Figure 1.5. Demolition Plan. Source: BVN, 11 May 2021.

Figure 1.6. Operational Footprint. Kingfisher 2022

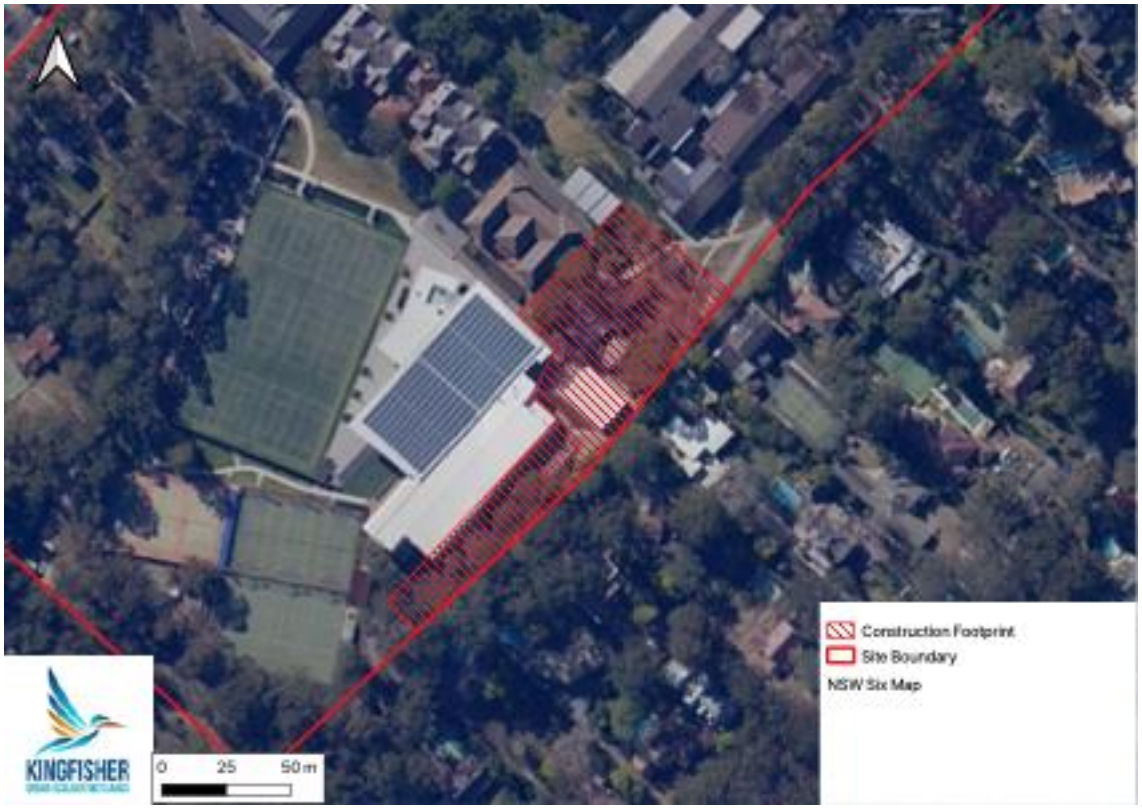


Figure 1.7. Construction Footprint. Kingfisher 2022.

1.4 Sources of information used in the assessment

The following sources of information were used for this assessment:

- SeedMaps 2021
- SydneyMetroArea_v3.1_E-VIS_4489 OEH (2016)
- BioNet DPIE (2021)
- Planning for Bush Fire Protection (PBP) NSW RFS 2019.
- Environmental Impact Statement. glendinning minto & associates p/l, December 2012.
- Arboricultural Impact Assessment. ArborSafe, 17 June 2021.
- PLC Grey House Precinct Council Presentation, 29 March 2021.
- Proposed Layout Plans. LTS Lockley, 03/07/21 Rev K.

1.5 Legislative context and statutory requirements

1.5.1 NSW Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000* institutes and sets out a system for environmental planning and assessment in NSW, and includes Part 4 which deals with development applications on private land and state significant development.
This proposal falls under a Part 4 development and requires development consent and associated environmental assessment.

1.5.2 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.
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 (s7.9), Biodiversity assessment for State significant development or infrastructure

(1) This section applies to—
(a) an application for development consent under Part 4 of the Environmental Planning and Assessment Act 1979 for State significant development, and
(b) an application for approval under Division 5.2 of the Environmental Planning and Assessment Act 1979 to carry out State significant infrastructure.
(2) Any such application is to be accompanied by a biodiversity development assessment report unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values.
(3) The environmental impact statement that accompanies any such application is to include the biodiversity assessment required by the environmental assessment requirements of the Planning Agency Head under the Environmental Planning and Assessment Act 1979.

NSW State Environmental Planning Policy Koala Habitat Protection 2021.

The State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2021 applies to the proposed development as there is no approved Koala Plan of Management which applies. The subject land is greater than one hectare and the land is identified on the Koala Development Application Map (DPIE, 2020). A separate Koala Assessment Report has been conducted. The site was not considered likely to provide core

koala habitat nor is suitable/core habitat within the site proposed to be irreversibly impacted. See Appendix V for EPBC act Consideration Koala Habitat Assessment and refer to Koala assessment report for further assessment and recommendations.
The assessment should assist the consent authority in determining any potential impacts on the species. This assessment addresses aspects of criteria outlined in the Koala Habitat Protection Guideline (DPIE, 2020) as detailed by the State Environmental Planning Policy (SEPP) (Koala Habitat Protection) 2021.

1.5.3 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.

1.5.4 Ku-ring-gai Local Environmental Plan (KLEP) 2015

Sections of vegetation within the site is identified as “Biodiversity” on the Terrestrial Biodiversity Map as published by Ku-ring-gui Council. (Map Identification Number: Terrestrial Biodiversity Map - Sheet BIO_008).
As identified in KLEP (2015) the aim of section 6.3 Biodiversity Protection, Clause 1 is to maintain terrestrial biodiversity by—
(a) protecting biological diversity of native fauna and flora, and
(b) protecting the ecological processes necessary for their continued existence, and
(c) encouraging the recovery of threatened species, communities, populations and their habitats, and
(d) protecting, restoring and enhancing biodiversity corridors.
The proposal will include revegetation areas and biodiversity strategies which will satisfy and contribute to the objectives of part 6.3, clause 1 in the KLEP. Mitigation measures are outlined in section 10 of this report.

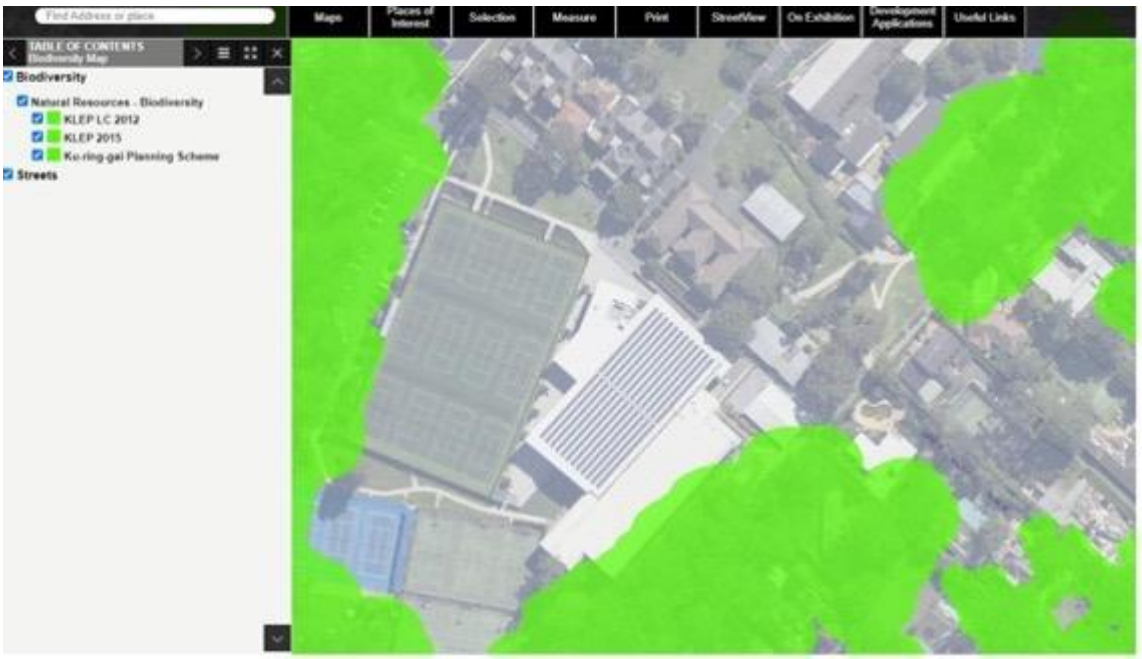
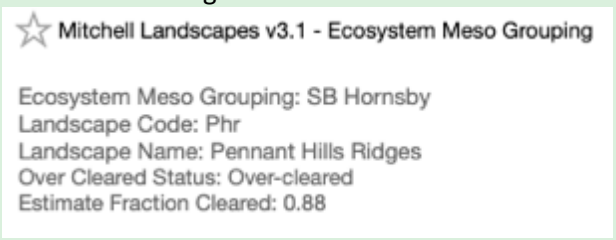


Figure 1.8. The site is situated on vegetation mapped as “Biodiversity” and on the Terrestrial Biodiversity Map as published by Ku-ring-gui Council.

2 Landscape features and site context

The site is located within residential and open spaces for passive recreation setting. The surrounding properties are made up of medium density residential 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 	Pennant Hills Ridges Phr 
% Native vegetation cover Total Buffer Area = 1,038.55ha Native Vegetation Area within Buffer = 425.17ha	41% in the 1500m radius circle See Figure 2.1
Landscape features	
Rivers and streams	A drainage gully exists adjacent to the current access path along the boundary of the site, although it is not considered a waterway and should not be classified as such. The drainage gully does not contain an observable channel, banks or fluvial bed forms.
Wetlands	N/A
Connectivity features	Vegetation on site is connected to adjoining bushland via patches of remnant/exotic trees and inconsistent structural layers. Currently within the site native planted screening provides minimal connectivity between patches of mature canopy species.
Areas of geological significance and soil hazard features	No
Areas of Outstanding Biodiversity Value identified under the BC Act	No

Geology and Soil	"Glenorie" is the identified soil landscape for the site as per eSpade2.0 (DPIE, 2020). Glenorie is categorised by low rolling and steep hills. Local relief 50–120 m, slopes 5–20%. Convex narrow (20–300 m) ridges and hillcrests grade into moderately inclined side slopes with narrow concave drainage lines. Moderately inclined slopes of 10–15% are the dominant landform elements Soil - shallow to moderately deep (200 cm) Yellow Podzolic Soils and Gleyed Podzolic Soils along drainage lines.

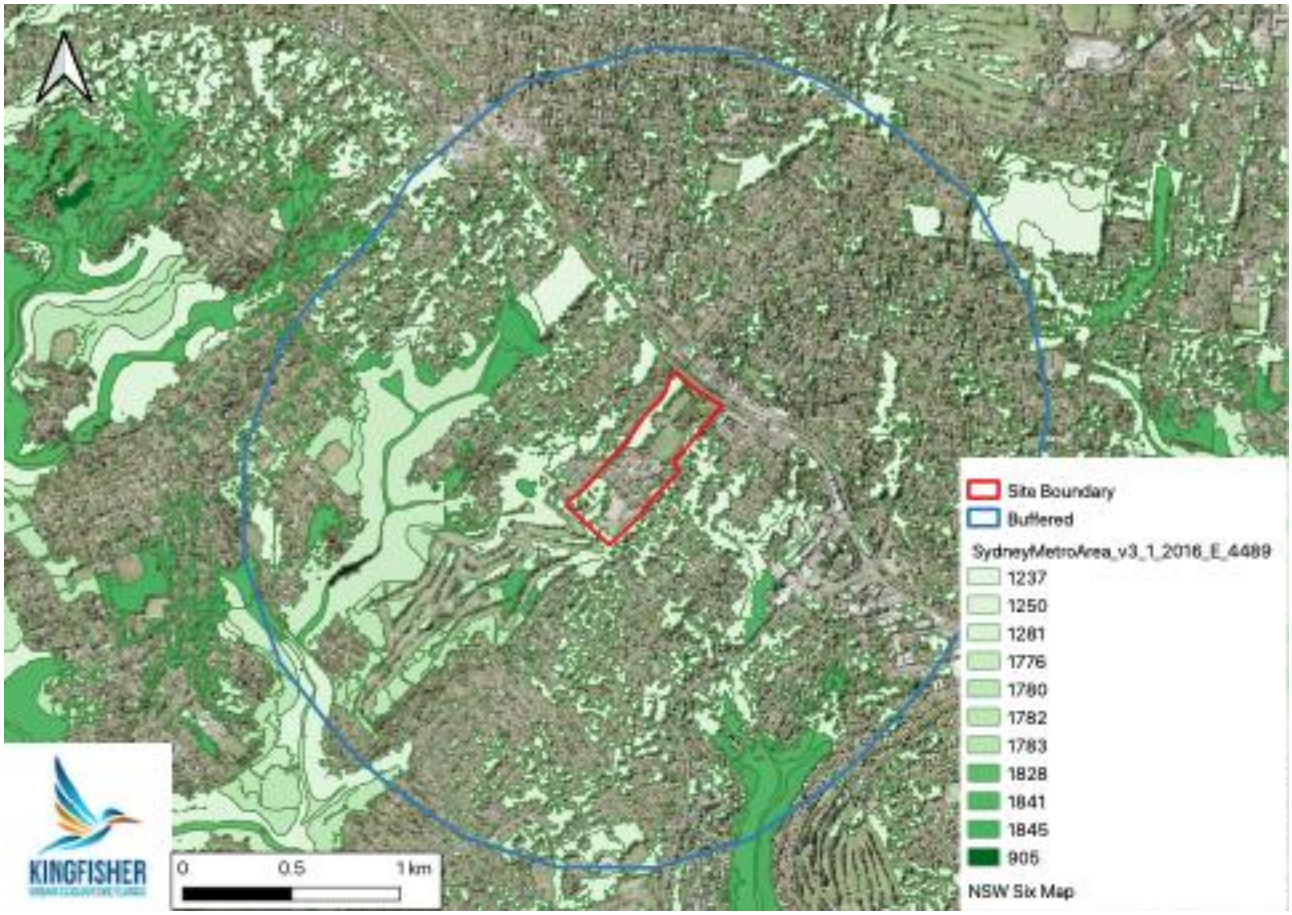


Figure 2.1 Location Map Native vegetation cover within 1500m buffer around the site. Seedmap, 2021.

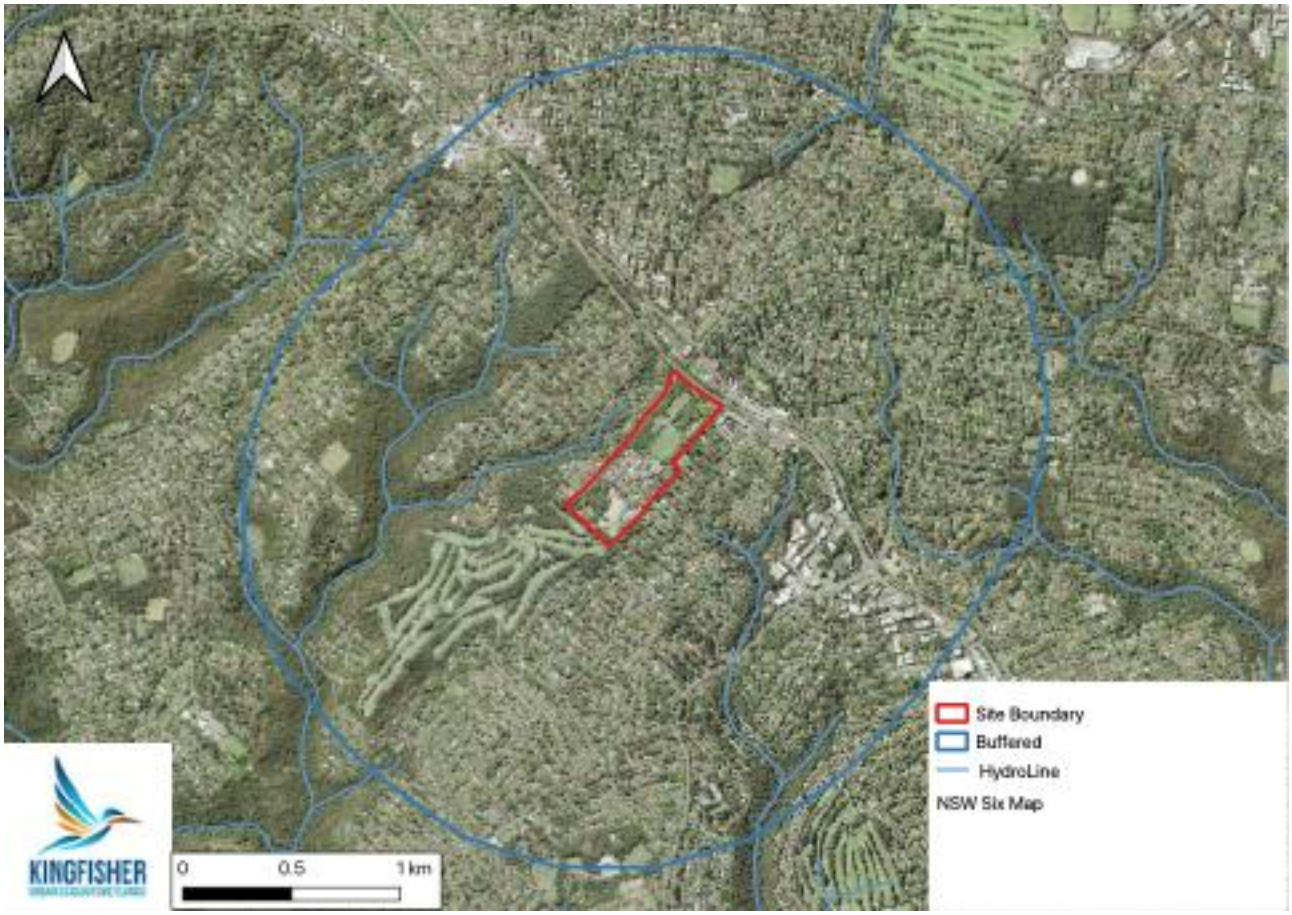


Figure 2.2. Hydrolines Mapping within 1500m Buffer of the site. Kingfisher, 2022. Data Source: NSW Government Spatial Data, Hydrolines.

3 Native vegetation

3.1 Desktop and Survey results – Plant Community Types (PCTs)

A review of the most up-to-date vegetation mapping, SydneyMetroArea_v3.1_VIS__4489 DPIE (2016), identified two (2) plant community types (PCTs) within site. The PCT is identified as; *Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion* (PCT1281); and *Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion* (PCT1237).

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	Estimated Percentage Cleared
1281	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion	Sydney Turpentine-Ironbark Forest State Conservation: Critically Endangered Ecological Community (CEEC)	Sydney Turpentine-Ironbark Forest Commonwealth Conservation: Critically Endangered (CE)	90%
1237	Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Blue Gum High Forest in the Sydney Basin Bioregion State Conservation: Critically Endangered Ecological Community (CEEC)	Blue Gum High Forest in the Sydney Basin Bioregion Commonwealth Conservation: Critically Endangered (CE)	90%

3.1.1 Patch Size

The vegetation within the site is connected to surrounding vegetation through inconsistent structural layers and scattered native canopy. Native vegetation is also present within the surrounding residential landscape and southern Golf Course. For this reason patch size associated with the on-site vegetation was assessed as >100 ha within the BAM-C.

3.1.2 Field Survey

The field survey assisted in verifying the distribution and quality of vegetation at the site. Sydney Turpentine-Ironbark Forest (STIF) (PCT1281) is mapped across the site via *The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489.*

Approximately 80% of the vegetation onsite has been previously disturbed. The canopy is discontinuous onsite with scattered canopy trees. The mid stratum is primarily absent within site boundaries. The ground stratum has been highly disturbed, with much of the site dominated by exotic turf grasses and 'High Threat Exotic' (HTE) species. Vegetation adjacent to the access path is displaying signs of natural regeneration although this is being hindered by current land use practices.

Vegetation Zone 1 has undergone historical clearing and previous development of this area including ground leveling, hard landscaping, paving roads and creation of building foundations would have irreversibly impacted on the original plant community to the point that it is not able to recover. However, the Scientific Committee's final determination for STIF includes a stand of Remnant STIF trees can meet the definition for STIF. Therefore, vegetation in this zone has been assessed as a part of the STIF CEEC in the BAM-C

Vegetation Zone 2 has been assessed as Sydney Turpentine-Ironbark Forest (STIF) (PCT1281) in the BAM-C. This finding was concluded following desktop investigations and field assessments. See section 5 for a description of vegetation zones and the impact assessment.

Stratification and plot dimensions

Plots were as per the BAM Method with 20 x 20 and 10 x 40 plots (400m^2) for assessing structure and composition with a centre line extending 50m and 100m to create a 20 x 50 and 10 x 100 plot (1000m^2) 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

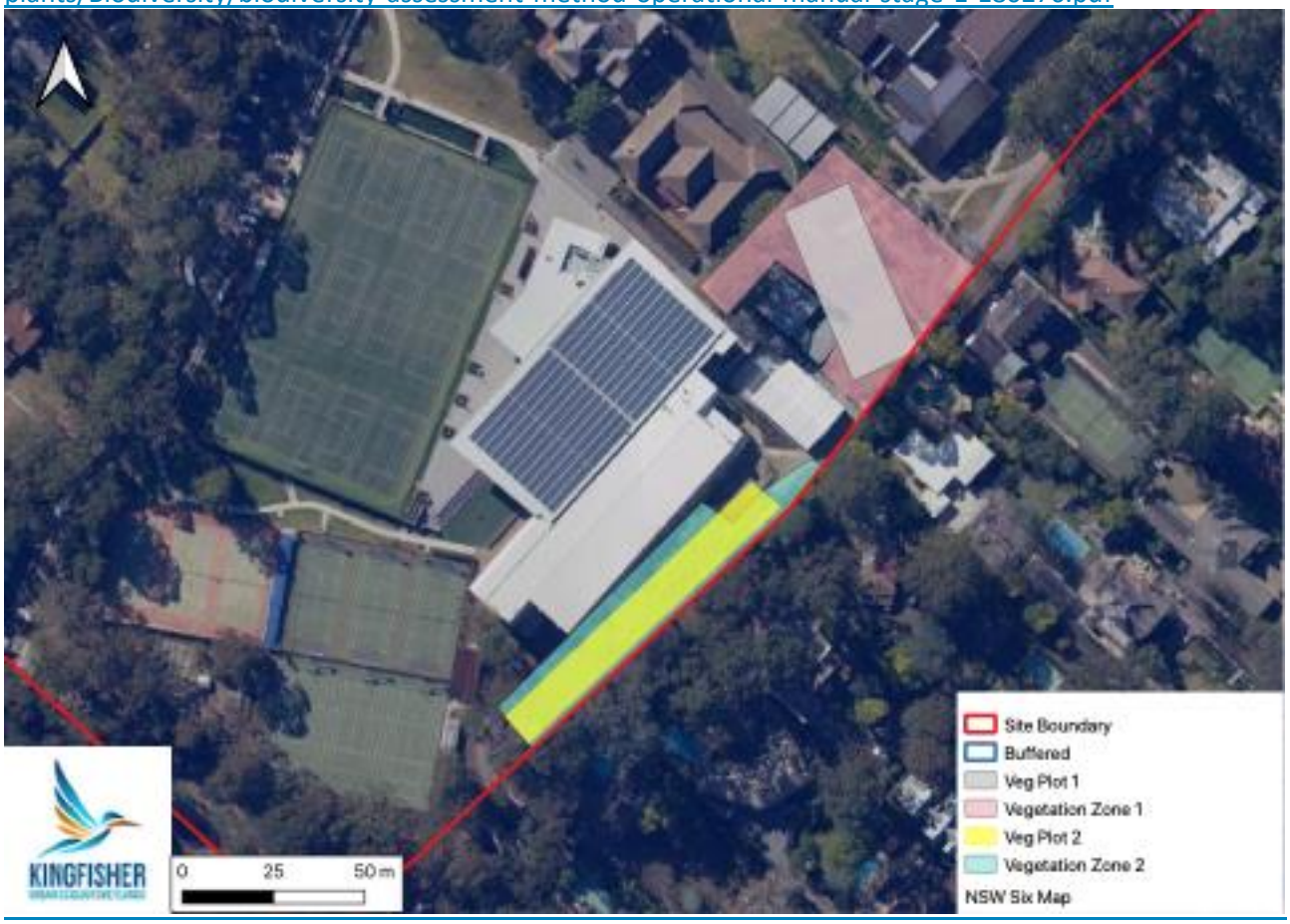


Figure 3.1 Vegetation zones and Plot locations

Figure 3.2 Fragmented vegetation across the surrounding landscape.

Figure 3.3 Previously mapped EEC/CEEC BGHF orange and STIF blue. The Native Vegetation of the Sydney Metropolitan Area - Version 3.1 (OEH, 2016) VIS_ID 4489

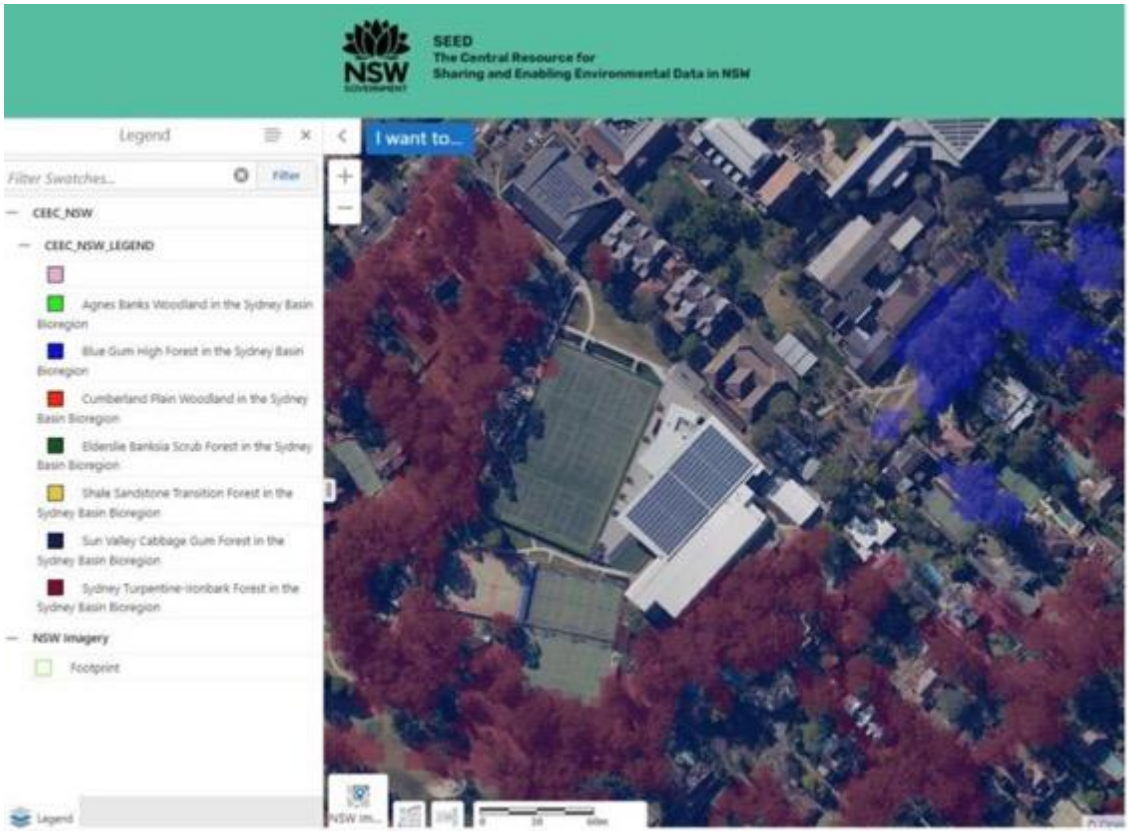


Figure 3.4 Extract from SEED has the area of proposed works mapped as STIF. This includes mapping of the canopy cover over the existing path/road

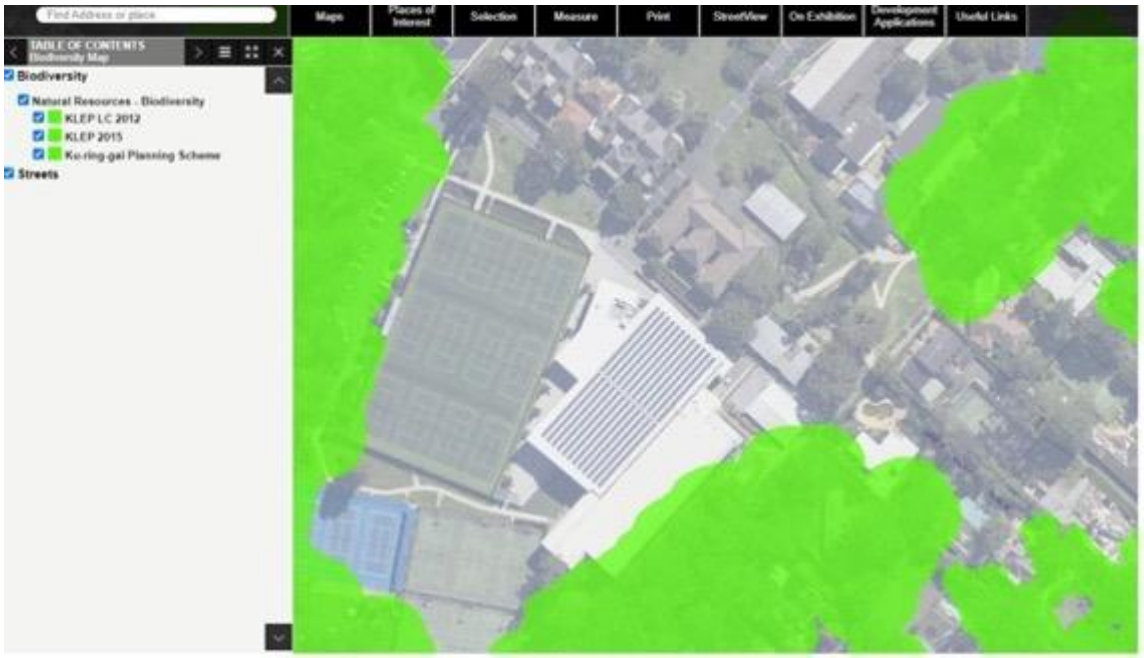


Figure 3.5 Ku-ring-gai online map viewer has the area marked as the biodiversity layer. Source: Ku-ring-gai Council 2021.

Ground truthing shows the area mapped as STIF includes existing built form/road and has canopy species of STIF over this accessway. The vegetation condition map in Figure 3.5 shows the area (above the accessway) as 'built-form' and the adjoining vegetation (canopy trees and occasional *Pittosporum undulatum*) in fair condition.

Figure 3.6 Current vegetation condition onsite.

NB: there is no native vegetation communities in the school grounds in good or excellent condition. The school has already been undertaking bush regeneration in the areas of BGHF and STIF (this doesn't include the proposed development area as this is not bushland).

The two Endangered Ecological Communities onsite; Sydney Turpentine-Ironbark Forest (STIF) and Blue Gum High Forest (BGHF), continue to support a range of native flora and fauna. Weeds infestations are present in most areas, however through ongoing bushland management these areas can be re-established as pristine examples of their respective communities.

3.1.3 Site Photos

The following photos were collected during two site visits by Ecologist Luke Johnson.

Plate 3.1 Plot 1 (Demolition and site footprint)

Plate 3.1.1 Plot 1 Location: Development footprint.

Plate 3.1.2 Vegetation is domintated by a mix of native and exotic planted species.

Plate 3.1.3 Vegetation is domintated by a mix of native and exotic planted species.

Plate 3.1.4 Approximately 50% of the development footprint has been cleared of all native vegetation

Plate 3.1.5 Approximately 50% of the development footprint has been cleared of all native vegetation

Plate 3.1.6 Planted exotic garden

Plate 3.1.7 Planted native *Acacia pendula*

Plate 3.1.8 Exotic vegetation within plot

Plate 3.1.9 Carpobrotus sp. within plot

Plate 3.1.10 Mixed vegetation within building footprint

Plate 3.1.11 Mulch and garden management have inhibited native regeneration

Plate 3.1.12 Footpaths and exotic garden species within building footprint

Plate 3.1.13 Nest box located on tree proposed for removal. Nest box is unproperly hung and in a state of disrepair. Currently uninhabited by fauna.

Plate 3.1.14 Cleared area with exotic grass and canopy species proposed for removal

Plate 3.1.15 Cleared area with exotic grass species proposed for removal

Plate 3.2 Plot 2 (Site access path)

Plate 3.2.1 Plot 2 Location: Site access path

Plate 3.2.2 Vegetation consists of exotic turf grasses and canopy species associated with STIF plant community.

Plate 3.2.3 Vegetation within plot is a mix of exotic ground species with no clear middle stratum.

Plate 3.2.4 Weed species within plot 2.

Plate 3.2.5 drainage channel running southwest along the current access path

Plate 3.2.6 High abundance of Tradescantia flumensis within the vegetation and channel.

Plate 3.2.7 Westernside of the acess path is showing signs of regeneration.

Plate 3.2.8 Example of dominant ground vegetation within plot 2.

Plate 3.2.9 Mixed vegetation adjacent to the acess path.

Plate 3.2.10 Hollow bearing tree within proximity to acess path (proposed retention and tree protection)

Plate 3.2.11 Hollow bearing tree

Plate 3.2.12 Two smaller Turpentine trees proposed for removal due due to impacts from widening requirements of the access way.

Plate 3.2.13 Canopy vegetation consistant with STIF plant community.

Plate 3.2.14 T829 Proposed for removal due to impacts from access widening requirments.

Plate 3.2.15 T839 Proposed for removal due to impacts from access widening requirments.

Plate 3.3 Broader Vegetation and site characteristics.

Plate 3.3.1 Planted native border vegetation proposed to be retained.

Plate 3.3.2 Landscaping rock present throughout the garden landscaping.

Plate 3.3.3 Example of landscaped native garden in plot 1 with placed rock habitat.

Plate 3.3.3 Example of landscaped native garden along boundary garden with placed rock habitat.

Plate 3.3.4 Planted non-local native species along the southeast border of the site.

Plate 3.3.5 Blue Gum High Forest located northeast of the proposed Grey House Precinct development

Plate 3.3.6 High Weed abundance along the eastern border of the site.

Plate 3.3.7 STIF community and location of plot 2: access path.

4 Threatened Species

4.1 Flora and Flora Field Survey

No threatened flora or fauna species were identified during Kingfisher 2021 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.

However, 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. Searches and call playback was not conducted for forest owls and no individuals were observed 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 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. 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 optional 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*). Although no threatened Reptile or Snail species were identified during site investigations.

4.1.7 Koala assessment summary

The proposal is unlikely to have a significant impact on the Koala or areas of critical habitat for the species. It is unlikely that the species would occur on site due to the degraded nature of vegetation and habitat, as such, there is a low likelihood of occurrence for the species.
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. Direct observation surveys for the species were generally opportunistic in nature, however no individuals were observed on site. Indirect survey methods including; scat and scratching's searches (outlined in DotE; 2014) were conducted. No evidence of the species was found on site.

4.2 Threatened Flora - Desktop

A total of 31 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 2021.

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E1	V	2
Fabaceae (Mimosoideae)	*Acacia clunies-rossiae*	Kanangra Wattle	V		1
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	2
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V,3		6
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue Orchid	V,P,2	V	1
Myrtaceae	*Darwinia biflora*		V	V	389
Myrtaceae	*Darwinia peduncularis*		V		1
Poaceae	*Deyeuxia appressa*		E1	E	3
Ericaceae	*Epacris purpurascens* var. *purpurascens*		V		36
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V	V	8

Family	Scientific Name	Common Name	NSW status	Comm. status	Records
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	2
Rubiaceae	*Galium australe*	Tangled Bedstraw	E1		1
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E1,P,2	E	51
Orchidaceae	*Genoplesium plumosum*	Tallong Midge Orchid	E4A,P,2	E	1
Grammitidaceae	*Grammitis stenophylla*	Narrow-leaf Finger Fern	E1,3		6
Proteaceae	*Grevillea caleyi*	Caley's Grevillea	E4A,3	CE	1
Proteaceae	*Grevillea juniperina* subsp. *juniperina*	Juniper-leaved Grevillea	V		1
Haloragaceae	*Haloragodendron lucasii*		E1	E	27
Dilleniaceae	*Hibbertia spanantha*	Julian's Hibbertia	E4A,2	CE	5
Malvaceae	*Lasiopetalum joyceae*		V	V	4
Myrtaceae	*Leptospermum deanei*		V	V	12
Proteaceae	*Macadamia integrifolia*	Macadamia Nut		V	17
Proteaceae	*Macadamia tetraphylla*	Rough-shelled Bush Nut	V	V	1
Myrtaceae	*Melaleuca deanei*	Deane's Paperbark	V	V	38
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	E1,P,3	E	3
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*		V	V	5
Lamiaceae	*Prostanthera marifolia*	Seaforth Mintbush	E4A,3	CE	1
Orchidaceae	*Rhizanthella slateri*	Eastern Australian Underground Orchid	V,P,2	E	1
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	E4A		7
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E1	V	36
Elaeocarpaceae	*Tetratheca glandulosa*		V		75

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

4.3 Threatened Fauna - Desktop

A total of 46 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 5 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 2021.

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	V,P	V	2
Amphibia	*Litoria aurea*	Green and Golden Bell Frog	E1,P	V	6
Amphibia	*Pseudophryne australis*	Red-crowned Toadlet	V,P		95
Aves	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	CE	6
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		11
Aves	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	2
Aves	***Callocephalon fimbriatum***	**Gang-gang Cockatoo**	V,P,3		49
Aves	***Calyptorhynchus lathami***	**Glossy Black-Cockatoo**	V,P,2		24
Aves	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V,P		1
Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		4
Aves	*Ephippiorhynchus asiaticus*	Black-necked Stork	E1,P		1
Aves	*Glossopsitta pusilla*	Little Lorikeet	V,P		17
Aves	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		3
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		11
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		8
Aves	*Hirundapus caudacutus*	White-throated Needletail	P	V,C,J,K	43

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Aves	*Ixobrychus flavicollis*	Black Bittern	V,P		5
Aves	*Lathamus discolor*	Swift Parrot	E1,P,3	CE	10
Aves	*Limicola falcinellus*	Broad-billed Sandpiper	V,P	C,J,K	1
Aves	*Lophoictinia isura*	Square-tailed Kite	V,P,3		14
Aves	*Neophema pulchella*	Turquoise Parrot	V,P,3		1
Aves	*Nettapus coromandelianus*	Cotton Pygmy-Goose	E1,P		4
Aves	*Ninox connivens*	Barking Owl	V,P,3		6
Aves	*Ninox strenua*	Powerful Owl	V,P,3		790
Aves	*Pandion cristatus*	Eastern Osprey	V,P,3		2
Aves	*Petroica boodang*	Scarlet Robin	V,P		3
Aves	*Polytelis swainsonii*	Superb Parrot	V,P,3	V	1
Aves	*Ptilinopus superbus*	Superb Fruit-Dove	V,P		6
Aves	*Tyto novaehollandiae*	Masked Owl	V,P,3		2
Gastropoda	*Pommerhelix duralensis*	Dural Land Snail	E1	E	3
Mammalia	*Cercartetus nanus*	Eastern Pygmy-possum	V,P		84
Mammalia	***Chalinolobus dwyeri***	**Large-eared Pied Bat**	V,P	V	5
Mammalia	***Dasyurus maculatus***	**Spotted-tailed Quoll**	V,P	E	4
Mammalia	***Falsistrellus tasmaniensis***	**Eastern False Pipistrelle**	V,P		10
Mammalia	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E1,P	E	2

Class	Scientific Name	Common Name	NSW Status	Comth. Status	No. of records
Mammalia	***Micronomus norfolkensis***	**Eastern Coastal Free-tailed Bat**	V,P		26
Mammalia	***Miniopterus australis***	**Little Bent-winged Bat**	V,P		59
Mammalia	***Miniopterus orianae oceanensis***	**Large Bent-winged Bat**	V,P		195
Mammalia	***Myotis macropus***	**Southern Myotis**	V,P		18
Mammalia	*Petauroides volans*	Greater Glider	P	V	2
Mammalia	*Petaurus australis*	Yellow-bellied Glider	V,P		1
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	5
Mammalia	*Pteropus poliocephalus*	Grey-headed Flying-fox	V,P	V	1308
Mammalia	***Saccolaimus flaviventris***	**Yellow-bellied Sheathtail-bat**	V,P		8
Mammalia	***Scoteanax rueppellii***	**Greater Broad-nosed Bat**	V,P		15
Reptilia	*Varanus rosenbergi*	Rosenberg's Goanna	V,P		18

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

4.2 Endangered population

One (1) endangered population have been recorded to occur within 10km of the site. Table 4.3 below displays the populations.

Table 4.3. Endangered population observed in previous ecological surveys within a 10km radius of the study site. NSW DPIE Bionet 2021.

Class	Scientific Name	Common Name	NSW status	Comm. status	Records
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	E2,V,P,3		48

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. Habitat suitability has been assessed in Appendix I for candidate species generated in the BAM-C.

Stage 2: Impact Assessment

5 BAM Calculator

5.1 Vegetation Zones and Integrity Scores

Vegetation zones were determined on species composition at the site. The vegetation zones cover areas in which native vegetation is proposed for removal and/or modification. The two vegetation zones have been divided into management zones.
Future vegetation integrity (F-VI) scores in the BAM-C. Within the accessway, species diversity is expected to remain as per current survey results. However, the structural attributes of the vegetation will be modified in the accessway, therefore F-VI scores were adjusted accordingly. The complete vegetation removal management zones have a F-VI score of 0.
Data for the BAM-C was gathered across two BAM plots located in each vegetation zone at the site.

Vegetation Zone One (Building Footprint)
Zone one is the area proposed for the new building footprint and would require clearing to facilitate the development. This area has undergone previous clearing and development. Currently this zone consists of:

- Cleared ground with exotic turf and;
- Landscaped garden dominated by exotic species and cultivated natives and footpaths;
- Planted mature native canopy in the form of a mix of six mature trees *E. pilularis*, *E. microcorys* and *E. saligna* are present throughout the garden and proposed for removal. (ground cover of approximately 0.04 ha)

The poor structural diversity is reflected in the low vegetation integrity score. Vegetation is not mapped as any PCT however, prior to development would have once likely consisted as STIF transition to BGHF. Aborcultural impact assessment (ArborSafe, 2021) states the native canopy trees in this area were planted approximately 60 years prior. It is highly degraded; it does not reflect the natural attributes of the STIF community. However, the Scientific Committee's final determination for STIF includes a stand of Remnant STIF trees can meet the definition for STIF. Therefore, vegetation in this zone has been assessed as a part of the STIF CEEC in the BAM-C. Due to previous development of this area involving; landscaping, exotic species planting, mulch application and ongoing maintenance it is unlikely the original vegetation community would recover. The vegetation zone has been left as one management zone within the BAM-C. This will reflect the future actions; complete vegetation removal (0.02ha).

Zone Two (Site Accessway)
Zone two runs southwest of zone 1 and the site of the proposed development. This zone is proposed to be used as site access for vehicles and plant equipment. The zone consists of:

- A paved footpath (approximately 2m wide) with cleared understory and;
- Ground cover with high abundance of HTE;
- Native canopy trees associated with the STIF plant community.

Vegetation is mapped as STIF although marginally reflects attributes of the community due to disturbances. The area has a highly modified under and mid storey, which is not indicative of the original vegetation community. The ground vegetation is dominated by exotic grasses and high threat exotics. While signs of resilience are apparent through the presence of juvenile *Elaeocarpus* and *Pittosporum* species, high weed abundance and ongoing site management is inhibiting natural regeneration of this zone. The canopy is a mix of native species, with *E. paniculate* and *S. glomulifera* the dominant natives. The vegetation zone has been left as one management zone within the BAM-C. This will reflect the future actions; widening of the access path to a minimum of 4m to facilitate the proposed development and partial canopy tree removal in the form of 4 trees and canopy trimming. Currently the paved path is 2m wide along the majority of the 100m long accessway. The disturbance area is calculated as vegetation removal of 1m either side of the paved path for length of the accessway (0.02ha).

Table 5.1 Table of current vegetation integrity scores for vegetation zones on site.

PCT	Vegetation Zone	Area (Ha)	Vegetation Integrity (VI) Score	Future VI
1218 (STIF)	One – Building Footprint (Figure 5.1)	0.04	18.5	-18.5
1281 (STIF)	Two – Accessway (Figure 5.2)	0.02	28.4	-2.5
Total		**0.06**		

Table 5.2 Zone Condition Scores

Zone ID	Composition Condition	Structure Condition	Function Condition
1	5.5	23.1	49.5
2	12.5	26.7	68.9

Figure 5.1 Impact Area of native Vegetation in Zone 1 Building Footprint.

Figure 5.2 Impact Area in Native Vegetation in Zone 2 Accessway.

5.2 Species and Ecosystem Credits

The grand total cost to offset both ecosystem credits generated by this development is $21,491.16 (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.

5.2.1 Ecosystem Credit Species derived from BAM

The development and associated works generated two ecosystem credits for the site. This is a reflection of the very poor vegetation integrity at the site. See below, figure 5.3 for the ecosystem credit summary.

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	2	$18,562.74
							Subtotal (excl. GST)		**$18,562.74**
								GST	**$1,856.27**
								Total ecosystem credits (incl. GST)	**$20,419.01**

Figure 5.3. Ecosystem credit summary from the BAM calculator.

Table 5.3 Ecosystem credit species and sensitivity to gain class.

Ecosystem Credit Species	Sensitivity to Gain Class
Anthochaera Phrygia (Regent Honeyeater)	High
Artamus cyanopterus cyanopterus (Dusky Woodswallow)	Moderate
Callocephalon fimbriatum (Gang-gang Cockatoo)	Moderate
Calyptorhynchus lathami (Glossy Black Cockatoo)	High
Chthonicola sagittate (Speckled Warbler)	High
Daphoenositta chrysoptera (Varied Sitella)	Moderate
Dasyurus maculatatus (spotted-tailed Quoll)	High
Glossopsitta pusilla (Little Lorikeet)	High
Grantiella picta (Painted Honeyeater)	Moderate
Hieraaetus morphnoides (Little Eagle)	Moderate
Hirundapus caudacutus (White-throated Needletail)	High
Lathamus discolor (Swift Parrot)	Moderate
Lophoictinia isura (Square-tailed Kite)	Moderate
Melanodryas cucullate cucullate (Hooded Robin, south-eastern from)	Moderate
Melithreptus gularis gularis (Black-chinned Honeyeater, eastern subspecies)	Moderate
Micronomus norfolkensis (Eastern Coastal Free-tailed Bat)	High
Miniopterus australis (Little Bent-winged Bat)	High
Miniopterus orianae oceansis (Large Bent-winged Bat)	High
Neophema pulchella (Turquoise Parrot)	High
Ninox connivens (Barking Owl)	High
Ninox strenua (Powerful Owl)	High

Petroica boodang (Scarlet Robin)	Moderate
Petroica phoenicea (Flame Robin)	Moderate
Phascolarctos cinereus (Koala)	High
Pseudomys novaehollandiae (New Holland Mouse)	High
Pteropus poliocephalus (Grey0headed Flying Fox)	High
Saccolaimus flaventris (Yellow-bellied Shethtail-bat)	High
Tyto novaehollandiae (Masked Owl)	High
Varanus rosenbergi (Rosenberg's Goana)	High

5.2.2 Species Credit Species derived from BAM

The development and associated works generated species credits for one species including; Large-eared pied bat (*Chalinolobus dwyeri*).

In total the cost to offset the species credits generated will be $1,072.16 (including GST), assuming payment will be made into the Biodiversity Conservation Fund. The individual credit price for each species can be seen below in figure 5.4. Species polygon was assessed as the whole of management zone 2.

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	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	Vulnerable	$741.31	20.6900%	$80.00	1	$974.69
						Subtotal (excl. GST)	**$974.69**
						GST	**$97.47**
						Total species credits (incl. GST)	**$1,072.16**

Figure 5.4. Species credit summary from the BAM calculator.

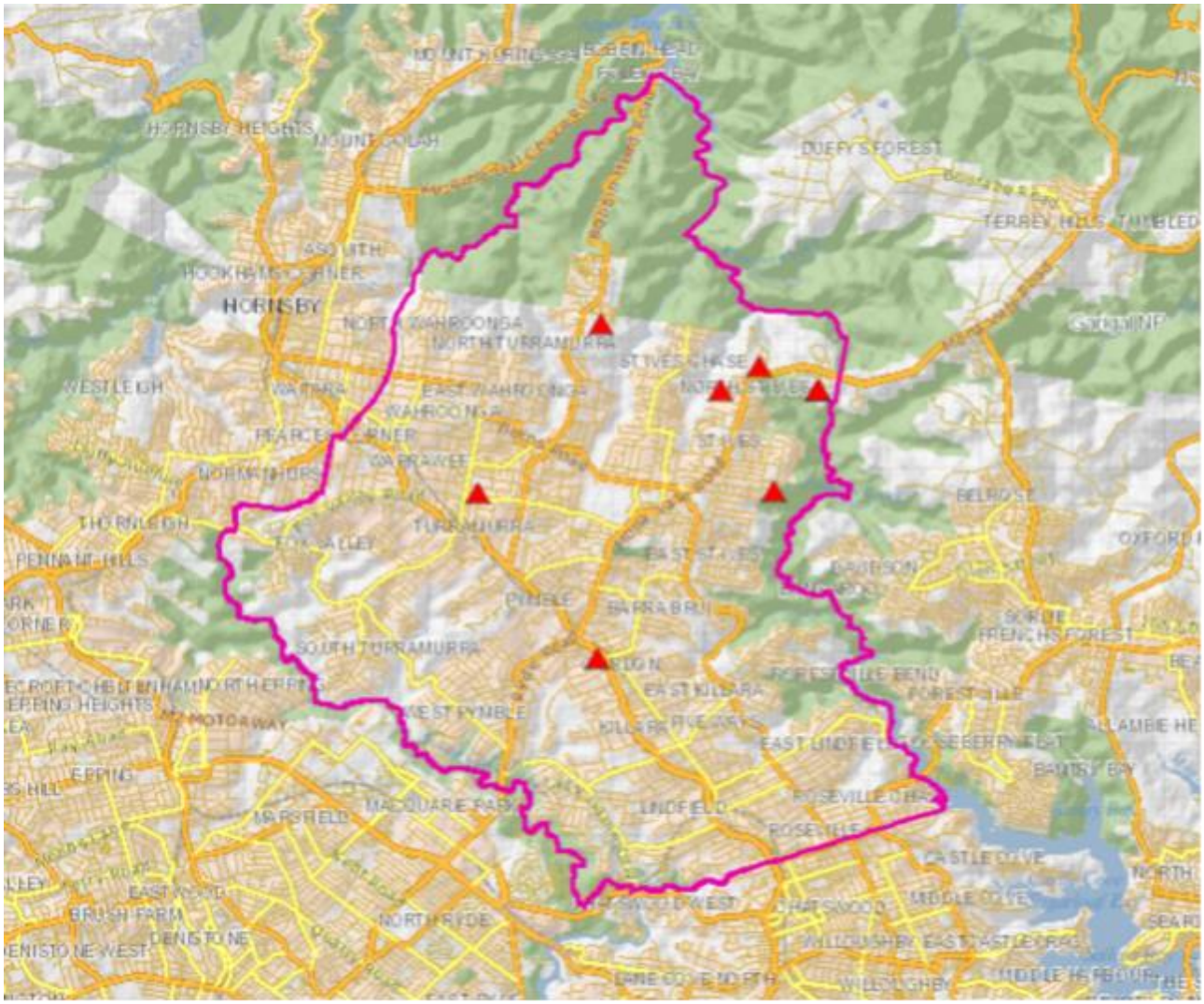


Figure 5.5. Previously recorded sightings of Large-eared Pied Bat within Ku-Ring-Gui LGA. Bionet Species Sightings. NSW Government, Accessed: 2022

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.
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, 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. See section “6.1.2 BAM Candidate Species for Further Assessment”.
The species credits generated in this BDAR were generated in the areas of “complete vegetation removal” and site “accessway widening”. The two vegetation zones were divided into these areas as the activities within the accessway area are not expected to significantly degrade or remove breeding habitat features (including hollows) for the species credit species. This method is in accordance with the BAM Section 6.4 (steps 3 - 6).

6 Direct Impacts

6.1.1 Vegetation disturbance and Loss

A mix of 29 native and exotic trees are required to be removed to facilitate both the footprint and access requirements for the proposal (see Figure 6.1). Arborcultural impact statement (Arborsafe 2021) determines that all trees proposed for removal are non-remnant and were previously planted.

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value		Category U No retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Remove for development	2	410, 411	13	45, 47, 48, 49, 50, 52, 392, 393, 399, 400, 401, 404, 406	14	51, 54, 394, 398, 402, 829, 839, 841, 882, 1758, 1759, 2007, 2008, 2009	0	

Figure 6.1 Tree removal plan. Arborsafe, 2021

Vegetation Zone 1 (Building footprint)

A total of 0.04 ha of vegetation within the building footprint (Vegetation Zone 1) will undergo complete removal. As discussed in Section 5 vegetation in this area consists of landscaped gardens and turfed lawn separated by paved footpaths. The ground vegetation is dominated by exotic ornamental species with a mix of local and non-local native species throughout. This area 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 100 years.

A total of 25 trees are required to be removed, of which 10 are planted natives. Table 6.2 below lists the trees proposed for removal in this area. *Trees in **bold** are native.*

Table 6.2 Trees proposed for removal in Vegetation Zone 1 Development footprint.

T45 Cinnamomum camphora	*T400 Quercus palustris*
T47 Stenocarpus sinuatus	*T401 Quercus palustris*
T48 Eucalyptus microcorys	*T402 Quercus palustris*
T49 Eucalyptus saligna	*T404 Quercus palustris*
T50 Eucalyptus microcorys	*T406 Quercus palustris*
T51 Casuarina cunninghamiana	***T410 Eucalyptus microcorys***
T52 Jacarana mimosifolia	***T411 Eucalyptus microcorys***
T54 Arbutus unedo	***T1758 Eleocarpus emundii***
T392 Liquidambar stryraciflua	***T1759 Eleocarpus emundii***
T393 Liquidambar stryraciflua	*T2007 Yucca filifera*
T394 Liquidambar stryraciflua	***T2008 Eucalyptus pilularis***
T398 Quercus palustris	*T2009 Prunis persica*
T399 Quercus palustris	

Vegetation Zone 2 (Accessway/construction entry road)

A total of approximately 0.02 ha of this area will be impacted as the development will require the widening of the existing paved footpath for vehicle access to the site, however currently most of the 4m wide access way is a combination of cleared ground/paved footpath (see site photos in section 3.1.2). Vegetation disturbance within the accessway will consist of the removal of 4 native trees (see table 6.3 below) and minor trimming of the canopy to facilitate the site access. Total canopy cover within the impacted vegetation zone was determined to consist of approximately 29% of the (10mx100m) vegetation plot. The canopy was predominantly located along the eastern (right hand side) of the plot. Patches of open canopy were also observed and contributed to the low total cover value. The removal of trees T839 and T841 will have negligible impact on the future percentage cover, as larger adjacent trees were already shading this area of the zone. T829 and T882 were both located on the boundary of the vegetation plot (see final arborist report for tree locations). This was due to the BAM required 10mx100m plot dimensions. Subsequently, the canopy of these two trees was only partially within the plot (<5m^2). A precautionary approach has been applied to the reduction of canopy cover, thus canopy trimming has been calculated as a loss of 20% cover in the future integrity calculations in the BAM-C. Manipulation of the future cover percentage was investigated for the total require credits associated with the impact. No difference in credit obligation occurs between the future impact of 5% – 20% reduction.

Vegetation on both sides of the footpath are showing signs of resilience, however high weed abundance and ongoing management practices are hindering revegetation of the surrounding STIF plant community. Depending on the design of the access way impacts would not be irreversible. Current species diversity, whilst low, is expected to not to be impacted.

Table 6.3 Trees proposed for removal in Vegetation Zone 2 Site Accessway

T882 Eucalyptus paniculatum	***T839 Syncarpia glomulifera***
T841 Syncarpia glomulifera	***T829 Syncarpia glomulifera***

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 mold) and Myrtle Rust (*Puccinia psidii* – type of fungus). See Appendix for Bushland Hygiene Protocols for Phytophora.

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 thus 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 downstream. Which may impact water quality, riparian vegetation and aquatic fauna. Recommendations to maintain and improve water quality on site have been listed in section 10 below.

8 Serious and Irreversible Impact Assessment (SAII)

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;

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

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

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 SAII 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 SAII and are impacted on by the proposal.

The BAM-C Credit report can be found in appendix IV.
The following section identifies SAII 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 SAII 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 SAII entity recognised by the BAM Calculator for the site.

Scientific Name	Common Name	Principles			
		1	2	3	4
Sydney Turpentine-Ironbark Forest (STIF) (PCT1281).	Sydney Turpentine-Ironbark Forest (STIF) (PCT1281).	X	X		
Chalinolobus dwyeri	Large-eared Pied Bat				X

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

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

Sydney Turpentine-Ironbark Forest (STIF) satisfies Principle 1 and 2 of SAII 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 a direct impact area of 0.06ha on STIF CEEC through clearing and modification of the canopy associated with widening of the access path to the site. This impact is within a patch of approximately 1.57ha of mapped STIF within the lot (DP69541 Lot 1) associated with the development. As of 2010 it is estimated that 2300 ha of STIF remains (Bionet Vegetation Classification/ Tozer et al. 2010). Although final determinations (2019) have estimated the total remaining area to 2,940ha. Bionet PCT classification identifies the PCT has undergone 90% clearance since pre-European arrival. The removal of approximately 0.06ha attributes to the loss of ~0.002% of the current extent. Vegetation on site has been significantly altered such that the site does not reflect the natural structural attributes of STIF. Vegetation marginally reflects attributes of the STIF community, this is primarily due historical actions on site including; clearing, erosion, grazing and exotic species. A majority of vegetation on site is regrowth or has been planted by property management. Exotic species are dominant across the site and are preventing the recruitment of the original vegetation community. The impacts will not be irreversible.
Thus, the proposed development is not expected to significantly contribute to loss of STIF due to the degraded nature of the site.

- **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. Evidence of avoiding and mitigating of impacts is detailed in section 10.
The species is known to roost in caves, overhangs, cliffs and mud nests of the Fairy Martin (*Petrochelidon ariel).* None of these features were identified within the impact area. An opportunistic survey of the surrounds revealed that the site is not in close proximity to optimal roosting habitat. The species was retained and assumed present in the BAM-C as the species may occasionally visit the site to forage. The SAII threshold for SAII in the Bionet TBDC is 'Breeding habitat identified by survey'.
The impact area hosts marginal foraging habitat for microbats in the form of canopy cover and insect abundance. Trees are expected to be removed within the Accessway footprint, resulting in a further loss of marginal foraging habitat. Alterations and degradation of habitat on site pre BDAR would have caused a greater disruption to the species than the proposed development.
Foraging habitat will lost within the footprint, 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.

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

- **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 in poor condition and it is unlikely that the original vegetation community would recover without assistance.
The proposal includes a potential habitat corridor along the drainage line and boundary which is 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.

- **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 building or the need to conform the bushfire protection requirements will be removed or modified.
Three 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).

8.1.4 Step four - Evaluate a serious and 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. The impact to STIF vegetation will not be irreversible and post-construction bush regeneration management is recommended to ensure recovery of the impacted 0.06 ha and improve the surrounding STIF vegetation. It is unlikely that this proposal would place STIF at risk of extinction or cause a serious or irreversible impact.

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

Maternity or breeding habitat is not present for any of the species within the impact area or on site. The impact area hosts marginal foraging habitat for microbats in the form of canopy cover and insect abundance. Foraging habitat will lost within the dwelling footprint, 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.

8.2 Information required as per Guidance to assist a decisionmaker to determine a serious and irreversible impact DPIE, 2019.

https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/guidance-decision-makers-determine-serious-irreversible-impact-190511.pdf

8.2.1 Additional impact assessment provisions for Threatened Ecological Communities (TEC)

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

Measures to avoid direct and indirect impacts have been provided in section 10 and 11. Alternative locations for the GHP were assessed during the conception phase and determined to be unsuitable due several reasons including: social, amenity and environmental impacts to TEC's on the School grounds. 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 in poor condition and it is unlikely that the original vegetation community would recover without assistance.
A VMP will be conditioned as a part of the DA to provide suitable ongoing management of the native vegetation within the site and increase the condition of the habitat corridor along the drainage line and boundary which is 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.

b. the area (ha) and condition of the threatened ecological community (TEC) to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone
The proposed development will have a direct impact area of 0.06ha on STIF EEC through clearing and modification of the canopy associated with widening of the access path to the site. This impact is within a patch of approximately 1.57ha of mapped STIF within the lot (DP69541 Lot 1) associated with the development. As of 2019 it is estimated that 2,940 ha of STIF remains (NSW Threatened Species Scientific Committee, final determinations 2019). Bionet PCT classification identifies the PCT has undergone 90% clearance since pre-European arrival. The removal of approximately 0.06ha attributes to the loss of ~0.002 of the current extent.
Vegetation on site has been significantly altered such that the site does not reflect the natural structural attributes of STIF Refer to (table 5.1 for VI score). Vegetation marginally reflects attributes of the STIF community, this is primarily due historical actions on site including; clearing, erosion, grazing and exotic species. A majority of vegetation on site is canopy regrowth in or has been planted by property management. Exotic species are dominant across the site including large maintained areas of turf, and are preventing the recruitment of the original vegetation community. The school commissioned a VMP in previous years, prepared by ecologist focussing on the core areas of Blue Gum Forest and STIF. The impacts within zone 2 are not considered irreversible and revelation works will improve the condition in this area post construction.
Thus, the proposed development is not expected to significantly contribute to loss of STIF due to the degraded nature of the site.

c. a description of the extent to which the impact exceeds the threshold for the potential entity
n/a The impact does not exceed the threshold.

d. the extent and overall condition of the potential TEC within an area of 1000 ha, and then 10,000 ha, surrounding the proposed development footprint
The overall condition of the remaining STIF within the surrounding lot displays a range of conditions. This been mapped and provided in Section 3. The condition of STIF within the surrounding landscape predominantly consists of remnant canopy trees in residential areas. The highest condition being isolated to Reserves system.

e. an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration
The proposed removal of 0.06ha of STIF will be a negligible impact on the extent and condition within the overall IBRA.

f. an estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and the IBRA subregion
Only 25.6 ha (2.2% of the extant community) of Turpentine-Ironbark Forest on the Cumberland Plain was located in national parks in 2002. At that time, 111.2 ha (9.4% of extant) were also located in local government Special Use zones, 106.2 ha (9.0%) in local government Environment Protection zones and 168.6 ha (14.3%) in local government Open Space zones (New South Wales National Parks and Wildlife Service 2002a).

Keith and Benson (1988) noted that none of the westernmost occurrences of the community in the Katoomba region of the Blue Mountains were reserved, but were restricted to small remnants on private property. Remnants further north on the Culoul Range are located in Wollemi National Park (Ryan et al. 1996), while remnant patches in the Glenbrook area (WSW of Penrith) occur in the Blue Mountains National Park (Benson 1992).

Source: Department of the Environment (2022). Turpentine-Ironbark Forest of the Sydney Basin Bioregion in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed 2022-06-09T13:34:08AEST

g. the development, clearing or biodiversity certification proposal's impact on:
i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns
Impact is expected to be negligible on abiotic factors as the function and use of the access path is not changing. STIF in the building footprint is located within a landscaped garden. Areas on the southern side will be landscaped post-construction with native species.

ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants
Impact on functionality of the TEC is isolated to remnant trees. These trees are expected to provide marginal foraging habitat for species. The removal of canopy also removes supply of future hollows that would be expected to form. This will be mitigated through nest box installation.

iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC
There was no potential occurrence of the TEC within the building footprint as the site has undergone previous development. Potential TEC within the access path will not be impacted as the area is already being used as a footpath and will continue to be in the future.

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

Fragmentation has already occurred due to previous development. Connectivity between the Access path canopy and Blue Gum High Forest to the north of the site will be reduced as a result of tree removal. Post construction native landscaping and ongoing bush regeneration is expected to improve connectivity in the 130m gap (Figure 11.1)

i. the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.
Mitigation measures have been provided in section 11. A combination of bush regeneration and native landscape planting are expected to contribute to the recovery of the TEC in the local region.

8.2.2 Additional impact assessment provisions for threatened species or populations

a. The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII.52 Guidance to assist a decision-maker to determine a serious and irreversible impact 15
The proposed location of the development is the most suitable location within the site, see section 10 for further details. Impacts to LEPB are isolated to the removal of marginal foraging habitat and indirect impacts of reduction in future natural hollow formation due to the removal of mature native canopy. Mitigation measures associated with impacts to all microbat species have also been presented in section 11.

b. The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification.
Local population size is unknown for LEPB. The vegetation on site is expected to provide marginal foraging habitat for the species.

c. The extent to which the impact exceeds any threshold for the potential entity.
N/a the threshold is not exceeded.

d. The likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to:
i. an estimate of the change in habitat available to the local population as a result of the proposed development
Impacts to LEPB are isolated to the removal of 0.02ha of marginal foraging habitat. Whilst no evidence has been recorded of the species utilizing hollows as habitat, it is considered that indirect impacts of reduction in future natural hollow formation due to the removal of mature native canopy.

ii. the proposed loss, modification, destruction or isolation of the available habitat used by the local population
The proposal will remove and modify 0.02ha of potential foraging habitat.

iii. modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development. BioNet Atlas records or other documented, quantifiable means must be used by the assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term within the IBRA subregion due to the direct and indirect impacts of the development.
Breeding habitat is not proposed to be removed as a result of the development. It is expected the vegetation to be modified provides marginal foraging habitat for the species. The species is highly mobile, and it is not expected the local population is reliant on the vegetation. Bionet atlas records have not recorded the species within the site or college grounds.

e. The likely impact on the ecology of the local population. At a minimum, address the following:
i. for fauna: – breeding – foraging – roosting, and – dispersal or movement pathways
Breeding/roosting (caves, buildings, culverts) habitat will not be removed as a direct result. Future potential breeding/roosting habitat will be removed in the form of mature native canopy, however no evidence of this species utilising tree hollows has been recorded.
A total of 0.02ha of marginal foraging habitat is proposed to be removed/modified. It is unlikely the local population of LEPB is reliant on these individual trees for foraging. The species is highly mobile, and movement is not expected to be impeded as a result of the proposal.

ii. for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available: – pollination cycle – seedbanks – recruitment, and – interactions with other species (e.g. pollinators, host species, mycorrhizal associations).
N/a

f. A description of the extent to which the local population will become fragmented or isolated as a result of the proposed development.
The species is highly mobile, and the proposal is not expected to fragment or isolate the local population of LEPB. Native canopy planting is proposed for the site post construction to increase connectivity between previously separated patches of vegetation within PLC.

g. The relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range.
No known local population has been identified within the site. Breeding habitat for the species is typically restricted to Sandstone ridgetops within the Sydney Basin. The site and surrounding school grounds does not contain these essential features. The proposed works would not be expected to separate/isolate a local population should it exist.

h. The extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population.
Vegetation on site is not considered to form essential breeding or foraging habitat, should a local population exist within the surrounding area. As such, the proposed native landscaping is expected to improve the potential foraging habitat for any local population.

i. An estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion.
No maternity roost sites are known in Queensland (TSSC 2012ad). In NSW, four maternity roost sites have been recorded (Hoye 2005), however, one was permanently flooded in 1976 and one was abandoned in 2009 (TSSC 2012ad). In general, the Large-eared Pied Bat has been poorly surveyed across its current known distribution. Non-targeted surveys have been carried out in parts of the species' range such as those undertaken by the NSW Office of Environment and Heritage in the Sydney Basin and Hunter Valley (NSW DEC 2004h, 2004i, 2004j, 2005bh) and southern Queensland (Queensland CRA/RFA Steering Committee 1997a).

Source: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=183

j. The measure/s proposed to contribute to the recovery of the species in the IBRA subregion.
Native landscaping and ongoing bush regeneration works are expected to contribute to the recovery of Large-eared Pied Bat species.

8.3 Information required as per Section 9.1.1 and 9.1.2. BAM 2020

8.3.1 Additional impact assessment provisions for threatened ecological communities at risk of an SAII

1. **The assessor is required to provide further information in the BDAR or BCAR regarding the impacts on each TEC at risk of an SAII. This must include the action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR and BCAR.**

Measures taken to avoid and mitigate have been presented in Section 10 of this report.

2. **The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including:**

    a. **evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal).**

The distribution of Sydney Turpentine-Ironbark Forest is highly restricted. The extent of occurrence (EOO) of STIF is 4,479 km2. Information on the disturbance since 1970 is not available, however it is generally agreed that approximately 0.05% remains of its original pre-European extant.

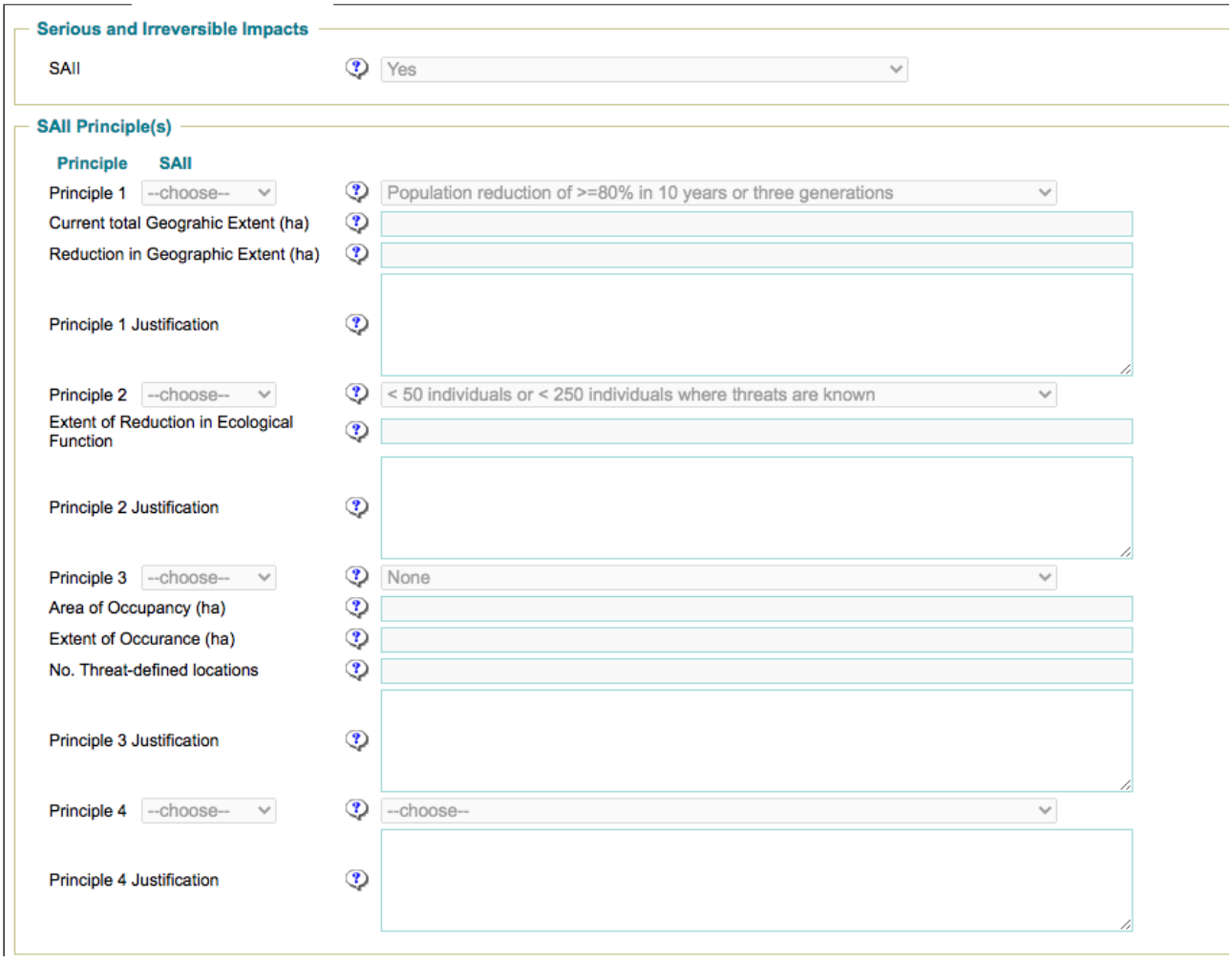


Figure 8.1. Bionet Atlas TBDC screen shot showing STIF is a potential SAII under Principles 1 and 2.

b. extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by:
i. change in community structure
ii. change in species composition
iii. disruption of ecological processes
iv. invasion and establishment of exotic species
v. degradation of habitat, and
vi. fragmentation of habitat

The following extract provides details pertaining to the items in question 2 (b) above. NSW Threatened Species Scientific Committee, Sydney Turpentine Ironbark Forest Final Determinations. 2019.

Remnants of Sydney Turpentine-Ironbark Forest have historically been subjected to a range of anthropogenic disturbances including logging, grazing by domesticated livestock and burning at varying intensities (Benson and Howell 1994). These disturbances have affected the structure and potentially the composition of remnants. For example, the density and average basal diameter of trees in remnants sampled by Benson and Howell (1994) suggested that the removal of large older trees has led to higher densities of smaller trees such that remnants typically have the structure of regrowth forest. Increased fire frequencies associated with hazard reduction burning have led to declines in populations of slow maturing, fire sensitive species and effected a structural simplification in some remnants of STIF. Conversely, remnants

with a long-term history of fire-exclusion, particularly when coupled with increases in nutrient and moisture availability, are characterised by higher densities and cover of mesic species (such as Pittosporum undulatum, Glochidion ferdinandi and Homalanthus populifolius), larger and more diverse populations of exotic species and lower diversity of understorey species (Rose and Fairweather 1997, McDonald et al. 2002, Howell 2003). 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' and 'Loss of hollow-bearing trees' are listed as a Key Threatening Processes under the Act.

Remnants of Sydney Turpentine-Ironbark Forest are typically small and fragmented and are susceptible to continuing attrition through clearing for routine land management practices due to the majority of remnants being located in close proximity to rural land or urban interfaces (Benson and Howell 1994; Tozer 2003). Applications to the NSW Land and Environment Court demonstrate that there is ongoing pressure to clear STIF in the course of developing private properties or for the establishment of Asset Protection Zones (https://www.caselaw.nsw.gov.au accessed 19/11/2018). 'Clearing of native vegetation' is listed as a Key Threatening Process under the Act.

Remnants of Sydney Turpentine-Ironbark Forest are subject to ongoing invasion by an extensive range of naturalised plant species. Weed invasion is exacerbated by the proximity of remnants to areas of rural and urban development and the associated influx of both weed propagules from gardens and nutrients contained in stormwater runoff, dumped garden refuse and animal droppings (Leishman 1990, Benson and Howell 1994, Leishman et al. 2004, Smith and Smith 2010). Species such as Ligustrum lucidum (Large-leafed Privet) and Ligustrum sinense (Small-leafed Privet) are highly invasive under conditions of enhanced soil nutrients and have been recorded in at least half of all plots sampling STIF by Tozer (2003). Other frequently recorded species include the shrubs Ochna serrulata (Mickey Mouse Plant), Phytolacca octandra (Inkweed), Sida rhombifolia (Paddy's Lucerne) and Chrysanthemoides monilifera (Bitou Bush/Boneseed), the scandent shrubs Lantana camara (Lantana) and Asparagus aethiopicus (Asparagus Fern), the climbers Araujia sericifera (Moth Vine), Asparagus asparagoides (Bridal Creeper) and Hedera helix (English Ivy) and the grasses Paspalum dilatatum (Paspalum), Ehrhata erecta (Panic Veldtgrass) and Setaria parviflora (Tozer 2003). 'Invasion and establishment of exotic vines and scramblers', 'Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat.)', 'Invasion of native plant communities by Chrysanthemoides monilifera', 'Invasion of native plant communities by exotic perennial grasses' and 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants are listed as Key Threatening Processes under the Act.

c. evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the:
i. extent of occurrence
ii. area of occupancy, and
iii. number of threat-defined locations

N/a

d. evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).

N/a

3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Subsection 9.1.1(2.), the assessor must record this in the BDAR or BCAR.

Does not indicate data is deficient.

4. In relation to the impacts from the proposal on the TEC at risk of an SAII, the assessor must include data and information on:

a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal:
i. in hectares,
0.06ha

and

ii. as a percentage of the current geographic extent of the TEC in NSW.
~0.002%. As previously stated in section 8.2. See section 6 and 7 for detailed impact assessment.

Data and information should include direct impacts (i.e. from clearing) and indirect impacts where partial loss of the TEC is likely as a result of the proposal. The assessor should consider for example, changes to fire regime (frequency, severity), hydrology, pollutants, species interactions (increased competition, changes to pollinators or dispersal), fragmentation, increased edge effects and disease, pathogens and parasites, which are likely to contribute to the loss of flora and/or fauna species characteristic of the TEC

b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:

i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals
Isolated area of the TEC do not occur within the PLC grounds (see figure 8.2). The local patch of STIF is connected to surrounding TEC to the south/west via mature canopy vegetation. Areas of native vegetation to the north of the school compromise of BGHF. The School maintains native bush along the boundaries throughout the grounds and this is connected to surrounding bushland through scattered canopy trees and inconsistent structural layers.

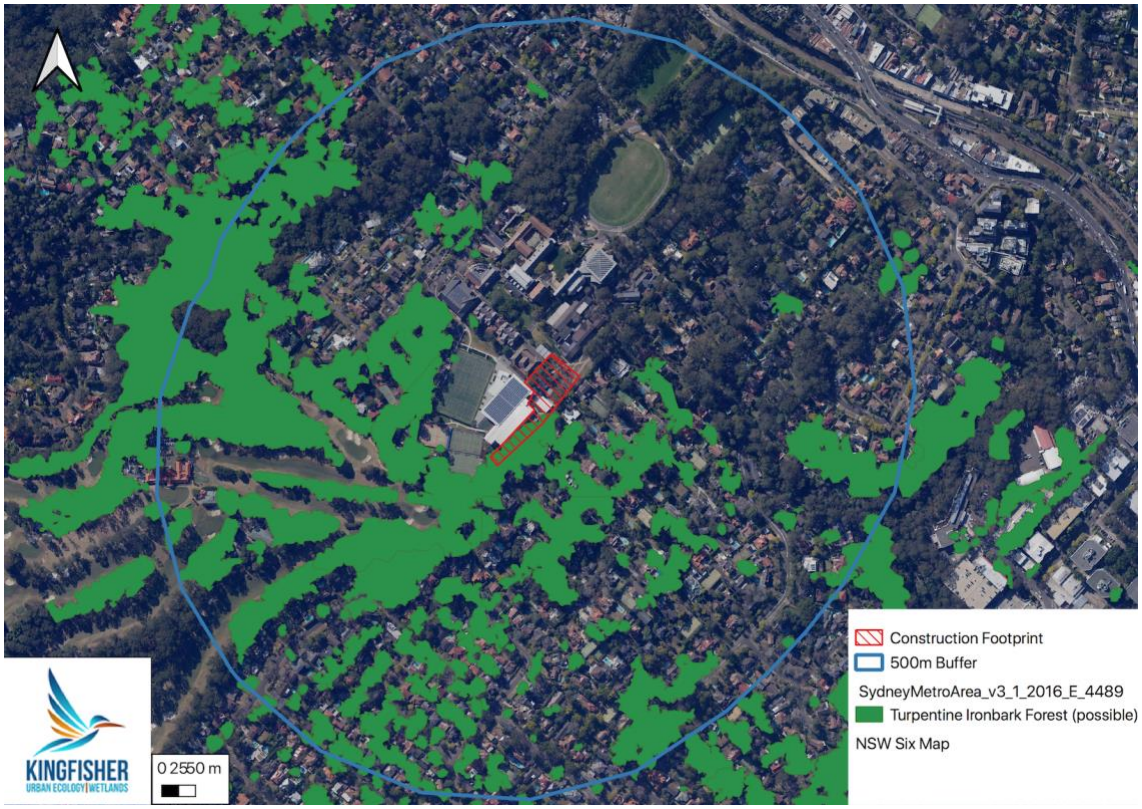


Figure 8.2. Mapped STIF within 500m of the construction footprint.

ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:

Distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and
No change in distance between patches of remnant TEC and the area to be impacted. The STIF proposed to be impacted does not exclusively connect two patches of STIF and will only be impacted by a reduction in canopy cover.

Estimated maximum dispersal distance for native flora species characteristic of the TEC, and
N/a see above.

iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.
The STIF community on site is currently in poor/fair condition. STIF community outside of the formal reserve system is generally characterised by remnant canopy with exotic understory.

Table 8.2 Vegetation Condition of STIF TEC

Veg Zone	Condition	Area	Composition score	Structure score	Function Score	VI score
1	poor	0.04	5.5	23.1	49.5	18.5
2	fair	0.02	12.5	26.7	68.9	28.4

5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.
N/a STIF remains at risk of SAII.

8.3.2 Additional impact assessment provisions for threatened species at risk of an SAII

1. The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.
Actions taken to avoid and minimise have been provided in sections 10. Mitigation measures are provided in section 11. Furthermore, subsequent surveys for potential microbat habitat within buildings proposed for demolition have resulted in no presence.

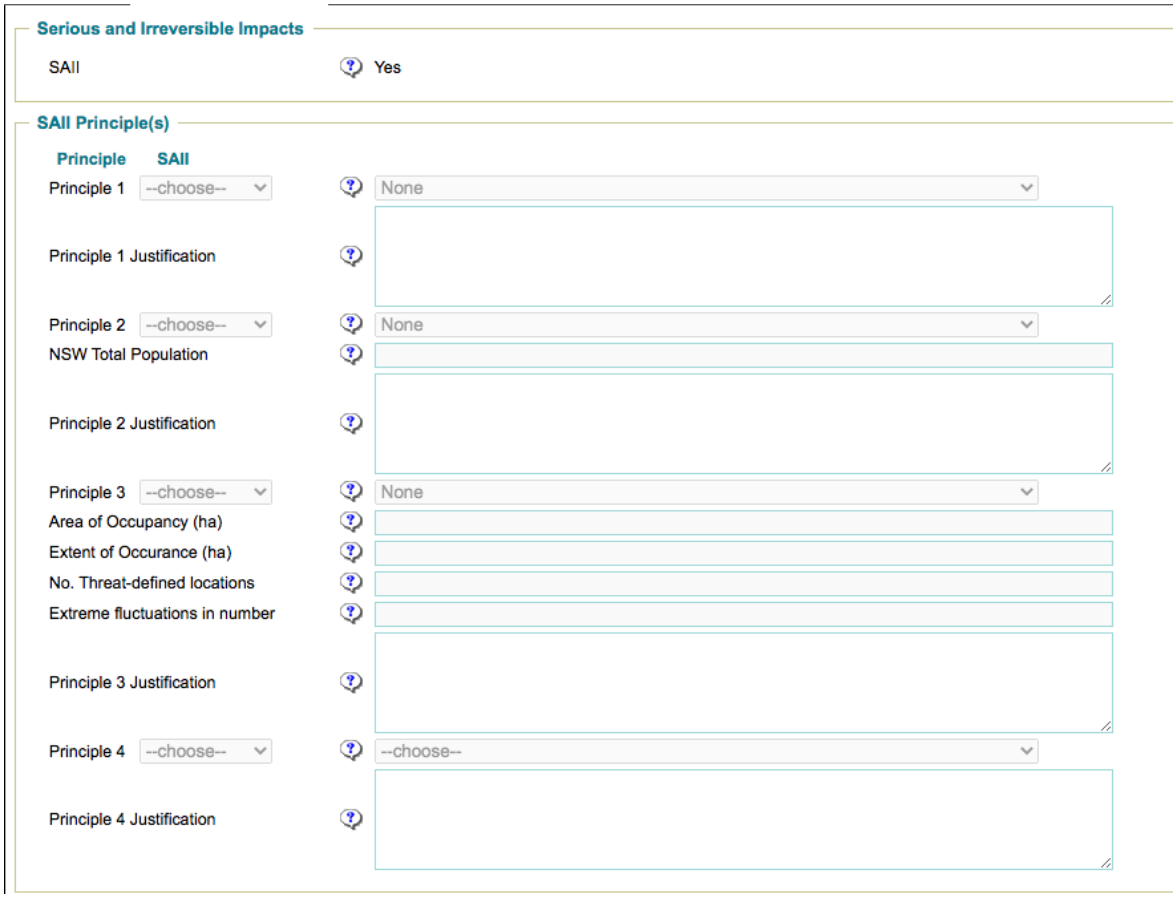


Figure 8.3. Bionet Atlas TBDC screen shot showing LEPB is a potential SAII under Principle 4.

2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including:
a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:
i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or
ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites
N/a

b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation)presented by:
i. an estimate of the species' current population size in NSW, and
ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and
iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations
N/a

c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:
i. extent of occurrence
ii. area of occupancy
iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and
iv. whether the species' population is likely to undergo extreme fluctuations
N/a

d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:
i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site
ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or
iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus)

The species cannot be reliably predicted to occur on a site based on vegetation and other landscape features (either foraging or breeding). Any impacts on breeding habitat used by this species could be considered potentially serious and irreversible. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas containing caves, or overhangs or crevices, cliffs or escarpments, or old mines, tunnels, culverts, derelict concrete buildings. Surveys must be undertaken as per the Threatened Bat Survey Guide to confirm breeding habitat.

9 Prescribed Impact Assessment

The development will not significantly impact features outlined in table 9 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.

Table 9. Expected impact on potential habitat onsite.

Feature	Present	Description of feature characteristics and location	Potential Impact	Potental 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	Yes	Landscaping rocks within the garden	Negligible	N/A	N/A
Human made structure	Yes	Demountable within the development site	Demolition of structure	Several Microbat Species	Section 8.1 and 9.1N/A
Non-native vegetation	Yes	Scattered throughout	Negligible	N/A	N/A

9.1 Demolition of Human-made Structures

The development proposal includes the demolition of two adjoining demountable structures. Microbat species are known to utilise human structures in residential and industrial areas where suitable natural roosting habitat is not available. The demolition of inhabited structures contribute to the removal of roosting habitat for the species'. ECA understands that these species also use inhabited buildings. Our conclusion was more from knowing these buildings inside and out and doing an assessment of habitat. We have supplement this with an Anabat survey. We know it is not the prime time for microbats in the colder months, however we still have been getting recordings of a range of species in other studies we are doing – by leaving detectors out longer. Plus, in this instant there is a very low chance of them using the building as these small, highly used demountable have fully sealed roof spaces, are low to the ground and if the bats were using the inside they would have been detected/seen. Or at least signs such as faecal matter.

10 Efforts to Avoid and Minimise

10.1.1 Consideration of Alternatives

'Do Nothing' Scenario
This option was dismissed as the objectives of the project would not be met. If the proposal was not to proceed, essential educational facilities would not be delivered. The College would have to continue relying on temporary premises, which fail to provide the modern teaching and learning facilities that are required to foster educational excellence and holistic learning opportunities.

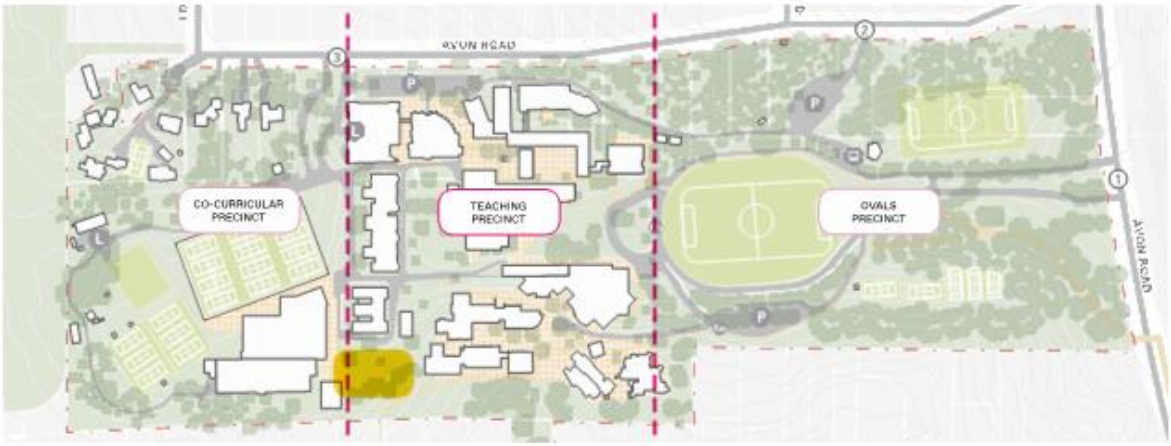
Alternative Locations within the PLC grounds
Alternative locations on the school – require knocking down existing built form, which does not respond to the required additional space needed and would result in removal of vital learning/teaching spaces for continued function of the school asset.

Alternative locations near site boundaries – locating the GHP close to existing site boundaries would result in unacceptable amenity impacts to adjoining residential dwellings through overshadowing, solar access and privacy. The building is setback from the south eastern boundary to ensure amenity to these residences is achieved.

Alternative vacant sites of similar size – all sites across the campus of this size are within areas that are vegetated. These locations are considered to have even greater impacts or require the same amount of trees to be removed. Vacant spaces are also considered to be a considerable distance from the existing learning spaces which does not allow for the operation of the School in a safe and efficient manner.

Alternative vacant sites general – existing sporting fields or facilities are the only other vacant sites that would cater to the proposed development size, these are also required to ensure the school has the relevant facilities needed. These areas are also distanced from existing learning spaces which does not allow for the school to function as required in terms of distances children can travel to class spaces.

BIODIVERSITY VALUE (SOURCE: DRAGONFLY)



COLLEGE PRECINCTS (SOURCE: MGS ARCHITECTS)

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Figure 10.1 PLC Masterplan. November, 2020.

10.1.2 Proposed Location and Design

Grey House Precinct

The proposed location of the Grey House Precinct is the most suitable within PLC. As previously discussed in this report, the site has been significantly altered due to previous development and consists predominantly of landscaped garden with a mix of exotic and native species. The removal of this garden will not significantly impact on threatened species. The removal of relatively recent planted native species are considered easily replaced and any impacts associated will be compensated by native landscaping post construction.

Site Access

Multiple routes were assessed for construction site access for vehicles and materials. The proposed access route is the most suitable location. PLC will continue to operate throughout the construction of the Grey House Precinct, alternative routes through the school, whilst not requiring removal of vegetation, would increase the risk of interactions of students and staff with construction vehicles and materials. This access route is able to be delineated from the rest of the campus and avoid unauthorised access to the site. Whilst the impact on vegetation and removal of four native trees is required the location of the access route balances the need to provide safe environment for people within the college and suitable access to the site.

Impacts associated with the access path are not considered to be irreversible and the native community is expected to recover with the removal of exotic weed species and bush regeneration activities.

11 Mitigation Measures

11.1 Wildlife corridor/ Revegetation

The proposed development site is situated between two previously separated patches of remnant vegetation (See figure 10.1). The planted mature native trees proposed for removal do not provide canopy connectivity between these patches. Whilst the current vegetation within the garden area proposed for removal and eastern property boundary consists of non-local native species, it is unlikely to provide a useful habitat corridor. Poor vegetation density and lack of community structure result in an approximately 100m long exposed area.

Post development native landscaping and revegetation along the boundary of the site would improve habitat connectivity within the site.

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. These species should be selected in consultation with an ecologist for the greatest ecological outcome from a combination of Sydney Turpentine-Ironbark Forest (STIF) and Blue Gum High Forest (BGHF) communities.

The drainage line adjacent to the access way and site boundary should be revegetated with species associated with STIF plant community. This can be implemented whilst also ensuring the areas satisfies bushfire protection requirements and footpath access to school facilities. 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. Plate 10.1 identifies the proposed locations for revegetation activities. Such actions will increase biodiversity within the site and the immediate landscape.

Figure 11.1 Potential improvement to habitat corridor within the site. SixMaps, 2021.

Plate 11.1 Revegetation is recommended for drainage channel and site boundary.

11.2 Tree replacement ratio

Any trees removed are replaced at a ratio greater than 1:1 (for trees not covered by a biodiversity offset strategy) and considers that a tree replacement ratio of 2:1 is preferable to 1:1 to mitigate the urban heat island effect and enhance habitat. 29 trees will be removed and 37 medium to large replacement trees will be planted.

11.3 Native Species Landscaping

Landscape planting schedule is revised by a qualified bush regenerator and the planting schedule uses a diversity of local provenance native species from the relevant native vegetation community (or communities) that occur, or once occurred on the site (rather than use exotic species or non-local native species). The northern part of the site has more formal and manicured plantings and they look to use a mix of native and non-native species.

11.4 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.

11.5 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.

11.6 Vegetation clearing control measures

Prior to removing any vegetation or other habitat that has been approved for removal, the applicant must engage a qualified and experienced ecologist to:

- Undertake a pre-clearing survey to delineate, map, and mark habitat-bearing trees and shrubs to be retained/removed and other fauna habitat features and determine the presence of any resident native fauna using nests, dreys, hollows, logs etc
- Supervise the clearance of trees and shrubs (native and exotic) and other habitat to capture, treat and/or relocate any displaced native fauna to an appropriate nearby location
- Remove sections of a tree containing a hollow or habitat prior to clearing and felling the tree.

11.7 Tree Protection

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

11.8 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 II for further details.

11.9 Native seed collection

Prior to the removal of any local native vegetation from the site including STIF seed from native trees and shrubs approved for removal is collected and it is propagated by a suitably qualified bush regenerator and used in the site plantings.

11.10 Replacement and installation of nest boxes

Where hollow dependent native fauna are found using existing hollows, compensatory tree hollows should be provided prior to removing the tree hollows and prior to the release of the hollow dependent fauna unless the removed tree hollows can be relocated and installed on the same day they are removed.

PLC will:

- provide details on the size, type, number, and location of nest boxes required – this would be based on the results of the pre-clearing survey
- install a minimum of 4 microbat boxes in the trees being retained
- install replacement nest boxes prior to any vegetation removal (preferably one month prior), to provide alternate habitat for hollow-dependent fauna displaced during clearing
- salvage and relocate the tree hollows approved for removal to appropriate locations on the same day the tree hollows are removed and prior to the release of any native fauna found using the tree hollows
- install other habitat features such as logs and bee hotels.

Image from: nestboxes.com.au

11.11 Monitoring of nest boxes

The installation and monitoring of the nest boxes would provide a great educational opportunity for the school. Monitoring of the nest boxes should create as little disturbance as possible to the native fauna using the boxes.

It is recommended the school prepares and implements a nest box monitoring program and a condition of consent is included to this effect and the program includes details on:

- the number of nest boxes to be monitored
- the GPS locations of the nest boxes
- the characteristics of all nest boxes to be monitored / the native fauna species that the boxes are designed for
- the duration and frequency of monitoring
- how the nest boxes are to be monitored (e.g., visual checks, installation of wildlife cameras which are motion activated)

The reporting program:

- nest box installation details (date installed, direction the box entrance faces, height above ground)
- the time of year, date and time that boxes are checked
- what was found in the nest box – the species and the number of individuals
- occupancy rates
- frequency of use
- pattern and timing of use
- maintenance needs

11.12 Reuse removed trees and hollows

The project will salvage and reuses any existing logs on the ground and native trees that are to be removed including hollows and tree trunks (greater than approximately 25-30cm in diameter and 2-3m in length)

and root balls are placed on the ground within the areas on-site that are to be replanted with local native species.
if the SSD project is not able to reuse all removed native trees, a condition of consent is included that the proponent consults with the local community restoration/rehabilitation groups, Landcare groups, and relevant public authorities including local councils, and Greater Sydney Local Land Services prior to any clearing commencing to determine if the removed trees can be re-used by others in habitat enhancement and rehabilitation work. This detail including consultation with the community groups and their responses should be documented.

11.13 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 the drainage channel. It is recommended that Bushland Hygiene Protocols be followed closely.

11.14 Translocation of juvenile native plants

Any juvenile local native plants that are removed by this SSD be replanted in the landscaped planting areas. The juvenile plants must be translocated prior to any earthworks and clearing of native vegetation commencing. The plants should be relocated by a suitably qualified bush regenerator when plant growth conditions are ideal to give the native plants the best possible opportunity to survive and should be maintained until established.

11.15 Preparing of a VMP as per a condition of consent

A Vegetation Management Plan (VMP) must be prepared by an appropriately qualified and experienced ecologist or bush regenerator and implemented as part of the SSD for the protection, maintenance, management and improvement in perpetuity of existing and planted native vegetation and fauna habitats on the site.
The VMP must include, but not be limited to, the following:
Establishment Phase:
i. The location of any vegetation to be removed and retained on the site.
ii. A list of any plant species to be removed and details on whether the plants are exotic, non-local native species or local natives.
iii. Details of the project timelines for any vegetation clearing and vegetation reinstatement.
iv. Details on the native vegetation communities and plant species that currently occur on the site.
v. Details of revegetation works, including a list of local native provenance species to be utilised.
vi. Procedures to demonstrate how plants and seed of local provenance are to be obtained and used – the plant species should be from the relevant native plant communities that occur in this area.
vii. Details on the number of plants to be planted, planting densities and species mix for replanting and demonstrate this is representative of the vegetation communities in its natural state/unmodified condition in this locality.
viii. Specific ecological fire management, mulch, soil and stormwater management measures.
ix. A plan showing clearly defined vegetation protection areas.
x. Vegetation and tree protection measures to be employed in vegetation protection areas.
Maintenance Phase:
i. Details on specific timeframes, performance monitoring (including the timing, number and frequency of visits); maintenance post completion of primary restoration works (including details on what the maintenance will entail, the duration, frequency and number of visits) and ongoing maintenance in perpetuity, performance measures, expected outcomes and responses;
ii. Details on plant loss replacement – any plant loss should be replaced by the same plant species.
iii. Specific management responsibilities.

iv. Other necessary habitat management or improvement measures.

Table 11.1. Mitigation Measures and Responsibilities

Mitigation Measure	Stage	Frequency	Responsible
Wildlife corridor/revegetation	Post construction (ongoing)	At the discretion of project bush regenerator	Project ecologist/bush regenerator
Tree Replacement Ratio	Post Construction	Initial planting with subsequent replacement planting for failed trees	PLC/ Project Landscaper
Native Species Landscaping	Pre- construction phase Construction phase Post construction (ongoing)	Ongoing	PLC/ Project Landscaper
Weed management	Pre- construction phase Construction phase Post construction (ongoing)	Weekly during active construction and monthly ongoing	Project ecologist/bush regenerator
Delineation of work areas	Pre- construction phase Construction phase	Installed during pre-construction	Site Supervisor/project ecologist
Vegetation clearing control measures	Pre- construction phase	Once	Project Ecologist
Tree protection	Pre- construction phase Construction phase	Installed during pre-construction	Project Arborist/ Project Ecologist
Weed removal techniques	Pre- construction phase Construction phase Post construction (ongoing)	At the discretion of project bush regenerator	Project Bush Regenerator
Native seed collection and propagation	Pre- construction phase	During clearing or at the discretion of the project ecologist	Project Ecologist/ bush regenerator
Replacement and installation of nest boxes	Pre- construction phase	Installed once and replaced every 5 years	Project Ecologist/PLC
Nest box monitoring	Post construction phase (ongoing)	Annually	PLC
Reuse removed trees and hollows	During habitat removal phase	Once	Project Landscaper/PLC
Pathogen prevention	Pre- construction phase Construction phase Post construction (ongoing)	Ongoing throughout each phase	Site Supervisor/ Project Ecologist/ bush regenerator

Translocation of juvenile native plants	Pre- construction phase	Once	Project Bush Regenerator
Preparation of a VMP as a consent condition	Pre-construction phase	Once Ongoing (5 years)	PLC/Project Ecologist

12 Conclusions

The proposed development will have an approximate impact area of 0.02 ha on Sydney Turpentine-Ironbark Forest (STIF) (PCT1281). This vegetation has been significantly altered and degraded from its natural state. Vegetation onsite has been significantly altered such that the site does not reflect the natural structural attributes of STIF. The grand total cost to offset both ecosystem credits and species credits generated by this development is $21,491.16 (including GST) assuming payment will be made into the Biodiversity Conservation Fund.

13 Appendices

13.1 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.

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

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
Orchidaceae	*Caladenia tessellata*	Thick Lip Spider Orchid	The Thick Lip Spider Orchid is from a group of orchids characterised by five long spreading petals and sepals around a broad down-curled 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. Generally found in grassy	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Species was not identified during flora survey.

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
			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). Within NSW, *Caladenia tessellata* is currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. The total population size is estimated to be less than 50 individuals.		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.
Proteaceae	*Persoonia hirsuta*	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	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Species was not identified during flora survey. 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.

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Species was not identified during flora survey. 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.
Clavariaceae	*Camarophyllopsis kearneyi*		Known only from its type locality in Lane Cove Bushland Park in the Lane Cove local government area in the Sydney metropolitan region. 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 *Camarophyllopsis kearneyi*. Does not produce basidiomes (above-ground fruiting structures) all year, but may be present only as non-reproductive hyphal structures below ground.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
					of clearing, fragmentation and on-going disturbance. No further assessment required.
Gyrostemonaceae	*Gyrostemon thesioides*		Occurs in open sclerophyll forest dominated by Eucalyptus sieberi. The species occurs on gentle east and south-facing slopes and on ridges in shallow sandy soil. Flowers September to December.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Species was not identified during flora survey. And the site lacks key habitat features associated with the species. 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.
Hygrophoraceae	*Hygrocybe anomala* var. *ianthinomarginata*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey,

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
			Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.		this is not the determining factor due to the cryptic nature of fruiting fungi. 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.
Hygrophoraceae	*Hygrocybe aurantipes*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. 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.

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
Agaricomycetes	*Hygrocybe austropratensis*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. 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.
Agaricomycetes	*Hygrocybe collucera*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi.

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
			ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.		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.
Agaricomycetes	*Hygrocybe griseoramosa*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. 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.
Agaricomycetes	*Hygrocybe lanecovensis*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and	Veg Zone 1: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
			Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg zone 2: No	the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. 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.
Agaricomycetes	*Hygrocybe reesiae*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. The site has been significantly altered and degraded from its natural state. It has a long history

Family	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
					of clearing, fragmentation and on-going disturbance. No further assessment required.
Agaricomycetes	*Hygrocybe rubronivea*		Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	Veg Zone 1: No Veg zone 2: No	Likelihood of occurrence for the species is low. Habitat is substantially degraded such that the species is unlikely to utilise area. Whilst the species was not detected during the flora survey, this is not the determining factor due to the cryptic nature of fruiting fungi. 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.

Class	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
Aves	*Anthochaera phrygia*	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.	Foraging: Yes Breeding: No	The site in not mapped on the Important Habitat Map (IHM) for the species. The site is located within an area mapped of known occurrence for the species in the National Recovery Plan for Regent Honeyeater, 2016. Species is unlikely to occur within the site, as vegetation within the site is highly disturbed and lacks a middle and ground vegetation. Site also lacks key habitat features associated with the species such as an abundance of mistletoes and bird richness. No further assessment required.
Reptilia	*Hoplocephalus bungaroides*	Broad-headed Snake	Nocturnal. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevice's or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce four to 12 live young from January to March, which is a relatively low level of fecundity.	Veg Zone 1: No Veg zone 2: No	Suitable habitat for the species is not present within the GHP site. Species in unlikely to occur. No further assessment required.
Mammalia	***Chalinolobus dwyeri***	**Large-eared Pied Bat**	Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine	Veg Zone 1 : Yes	Moderate likely hood of occurrence. The Site contains potential foraging habitat

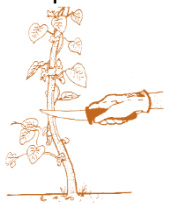
Class	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
			workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	Veg Zone 2 : Yes	for the species in the form of tree canopy within Vegetation zone 2. Caves and crevices are likely within 2km of the site. Species retained in calculator for Management zone 2.
Mammalia	*Miniopterus orianae oceanensis*	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 disperse within a 300km range. Forage in forested areas in the tree canopy.	Breeding : No Foraging: Veg zone 1: Yes Veg Zone 2: Yes	Moderate likely hood of occurrence. The site contains potential foraging habitat for the species in the form of adequate tree canopy within Vegetation zone 2. Two demountable structures are proposed to be removed, however these structures are currently in use and are well maintained. No potential breeding habitat is located within the disturbance area. No further assessment required.
Mammalia	*Miniopterus australis*	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	Breeding : No Foraging: Veg zone 1: Yes Veg Zone 2: Yes	Moderate likely hood of occurrence. The site contains potential foraging habitat for the species in the form of adequate tree canopy within Vegetation zone 2. The site lacks key breeding habitat requirements associated with the species. Vegetation within both zones of

Class	Scientific Name	Common Name	Habitat Requirements	Retained in BDAR Calculator	Site Suitability
			association with a large maternity colony of Common Bentwing-bats (*M. schreibersii*) and appears to depend on the large colony to provide the high temperatures needed to rear its young.		the site is highly disturbed and lacks midstory vegetation. A single hollow was identified within Management zone 2 in a tree proposed for retention. No further assessment required.
Aves	*Lathamus discolor*	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 *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to home foraging sites on a cyclic basis depending on food availability.	Breeding: No Foraging: Yes	The site in not mapped on the Important Habitat Map (IHM) for the species. The site is located in area of mapped know occurrence of the species. https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10455 The site displays moderate key foraging habitat requirements in in the form of Eucalypt canopy species; *E. pilularis* in Vegetation zone 2. Breeding occurs within Tasmania and returns to mainland foraging sites on a cyclic basis. No further assessment required.

13.2 Appendix II– Key Weed Removal Methods

Physical removal

Technique	Method	Equipment
Hand Removal 	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. 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	Tools: Gloves, Rakes, Knife and Weed Bags
Crowning 	Plants that possess rhizomes or bulbs might not respond to various removal techniques and may need to be treated with crowning. 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 Soil disturbance is to be kept to a minimum when using this technique.	Tools: Knife, mattock, trowel, impervious gloves, and all other required P.P.E.
Cut and Paint Stems 	Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent of vigorous growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. 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. 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	Tools: loppers, secateurs, pruning saw, herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide and all other required P.P.E.

Technique	Method	Equipment
Scrape and Painting 	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. 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. 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. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using the same method after sufficient regrowth has occurred.	Tools: knife, chisel, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.
Cut with a Chainsaw and Paint 	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. 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. 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.	Tools: chainsaw, ear muffs, protective clothing, safety glasses herbicide applicator/sprayer, impervious gloves, Roundup® Biactive Herbicide, and all other required P.P.E.

Technique	Method	Equipment
Spot Spraying	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. 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.	Tools: protective clothing, safety glasses, herbicide sprayer, impervious gloves, Herbicide, and all other required P.P.E.

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.

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.

13.3 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.

13.4 Appendix IV– BAM –C; Reports and Data

13.4.1 Payment Report.

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00027998/BAAS19008/21/00028108		3	08/06/2022

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Geraldene Susan Dalby-Ball	BAAS19008	Pymble Ladies College - Grey House Precinct	Finalised

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (Small Area)	08/06/2022	BOS Threshold: Biodiversity Values Map

PCT list

Price calculated	PCT common name	Credits
Yes	**1281** - Sydney Turpentine - Ironbark forest	2

Species list

Price calculated	Species	Credits
Yes	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	1

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

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	2	$18,562.74

Subtotal (excl. GST)	**$18,562.74**
GST	**$1,856.27**
Total ecosystem credits (incl. GST)	**$20,419.01**

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	***Chalinolobus dwyeri*** (Large-eared Pied Bat)	Vulnerable	$741.31	20.6900%	$80.00	1	$974.69

Subtotal (excl. GST)	**$974.69**
GST	**$97.47**

Assessment Id
00027998/BAAS19008/21/00028108

Proposal Name
Pymble Ladies College - Grey House Precinct

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Biodiversity payment summary report

Total species credits (incl. GST)	**$1,072.16**
Grand total	**$21,491.17**

Assessment Id	Proposal Name	Page 3 of 3
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13.4.2 Credit Summary Report.

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BAM Credit Summary Report

Proposal Details

Assessment Id 00027998/BAAS19008/21/00028108	Proposal Name Pymble Ladies College - Grey House Precinct	BAM data last updated * 24/11/2021
Assessor Name Geraldene Susan Dalby-Ball	Report Created 08/06/2022	BAM Data version * 50
Assessor Number BAAS19008	BAM Case Status Finalised	Date Finalised 08/06/2022
Assessment Revision 3	Assessment Type Part 4 Developments (Small Area)	BOS entry trigger BOS Threshold: Biodiversity Values Map

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

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

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

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BAM Credit Summary Report

Sydney Turpentine - Ironbark forest												
1	1281_fair	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	28.4	2.5	0.02	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	1
2	1281_Poor 01	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	18.5	18.5	0.04	PCT Cleared - 90%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	1
											Subtotal	**2**
											Total	**2**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
1281_fair	2.5	2.5	0.02			Vulnerable	Vulnerable	True	1
								Subtotal	**1**

Assessment Id
00027998/BAAS19008/21/00028108

Proposal Name
Pymble Ladies College - Grey House Precinct

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13.4.3 Predicted species report.

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00027998/BAAS19008/21/00028108	Pymble Ladies College - Grey House Precinct	24/11/2021
Assessor Name	**Report Created**	**BAM Data version ***
Geraldene Susan Dalby-Ball	08/06/2022	50
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS19008	Part 4 Developments (Small Area)	Finalised
Assessment Revision	**BOS entry trigger**	**Date Finalised**
3	BOS Threshold: Biodiversity Values Map	08/06/2022

* 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

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BAM Predicted Species Report

Koala	Phascolarctos cinereus	1281-Sydney Turpentine - Ironbark forest
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 Sheathtail-bat	Saccolaimus flaviventris	1281-Sydney Turpentine - Ironbark forest

Threatened species Manually Added

None added

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

Assessment Id: 00027998/BAAS19008/21/00028108 | Proposal Name: Pymble Ladies College - Grey House Precinct | Page 2 of 3

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BAM Predicted Species Report

13.4.4 Candidate species report

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BAM Candidate Species Report

Proposal Details

Assessment Id 00027998/BAAS19008/21/00028108	Proposal Name Pymble Ladies College - Grey House Precinct	BAM data last updated * 16/06/2022
Assessor Name Geraldene Susan Dalby-Ball	Report Created 29/06/2022	BAM Data version * 54
Assessor Number BAAS19008	Assessment Type Part 4 Developments (Small Area)	BAM Case Status Finalised
Assessment Revision 4	Date Finalised 29/06/2022	BOS entry trigger BOS Threshold: Biodiversity Values Map

* 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
Caladenia tessellata Thick Lip Spider Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Chalinolobus dwyeri Large-eared Pied Bat	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

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BAM Candidate Species Report

Persoonia hirsuta Hairy Geebung	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhodamnia rubescens Scrub Turpentine	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Broad-headed Snake	Hoplocephalus bungaroides	Habitat constraints Geographic limitations
Camarophyllopsis kearneyi	Camarophyllopsis kearneyi	Habitat degraded
Gyrostemon thesioides	Gyrostemon thesioides	Habitat degraded
Hygrocybe anomala var. ianthinomarginata	Hygrocybe anomala var. ianthinomarginata	Habitat degraded
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 lanecovensis	Hygrocybe lanecovensis	Habitat degraded
Hygrocybe reesiae	Hygrocybe reesiae	Habitat degraded
Hygrocybe rubronivea	Hygrocybe rubronivea	Habitat degraded
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints

BAM Candidate Species Report

Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat degraded
Swift Parrot	Lathamus discolor	Habitat constraints

13.4.5 Biodiversity Credit Report (Like for Like)

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00027998/BAAS19008/21/00028108	Pymble Ladies College - Grey House Precinct	24/11/2021
Assessor Name	Assessor Number	BAM Data version *
Geraldene Susan Dalby-Ball	BAAS19008	50
Proponent Names	Report Created	BAM Case Status
Kate Bimson	08/06/2022	Finalised
Assessment Revision	Assessment Type	Date Finalised
3	Part 4 Developments (Small Area)	08/06/2022
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		

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		

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
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	0.1	2	0	2

BAM Biodiversity Credit Report (Like for like)

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_fair	Yes	1	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.
	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion This includes PCT's: 1183, 1281, 1284	-	1281_Poor01	Yes	1	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	**1281_fair**	0.0	1.00

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: 00027998/BAAS19008/21/00028108

Proposal Name: Pymble Ladies College - Grey House Precinct

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NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

13.5 Appendix V– EPBC Act Considerations

The following section includes an assessment of potential impacts to the Koala (*Phascolarctos cinereus*) which is a listed species as per Matters of National Environmental Significance (MNES).
This assessment has used the *Significant impact guidelines 1.1- Matters of National Environmental Significance – page 11* to conclude whether the proposed activity will have a significant and irreversible impact on the species. The following section addresses significant impact criteria which applies to vulnerable species (including the Koala) listed on the EPBC Act 1999.

Survey effort.

The survey guidelines suggested within the Koala Habitat Protection Guideline (DPIE, 2020) and EPBC Act Referral Guidelines for the vulnerable koala published by Commonwealth Department of Environment (DotE; 2014) were used a general guide. 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 Kolas 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.
On site, detailed observations were made within all patches of vegetation. Individual trees were inspected at their base for koala scat, scratching's and presence / absence within each tree. No individuals were observed during the survey both on and off site.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

There is a low likelihood of occurrence for the species. It is unlikely that the species would occur on site due to the degraded nature of vegetation and habitat. No individuals (nor an important population) would be expected to occur on site. The site has been significantly altered such that it does not reflect natural attributes of the original vegetation community. Therefore, the proposal is unlikely to lead to a long-term decrease in the size of an important population.

Reduce the area of occupancy of an important population

The species or an important population of the species is unlikely to occur on site due to habitat degradation. Vegetation surveys revealed a low abundance of koala use trees within the impact area. As such the area is unlikely to be occupied by the Koala and the proposal is unlikely to reduce the area of occupancy of an important population.

Fragment an existing important population into two or more populations.

No important population for the species has been recorded in the assessment area. It is expected that the proposal will have a negligible impact upon individuals within the vicinity of the proposed development area.

Adversely affect habitat critical to the survival of a species.

No *Core koala habitat* is proposed to be impacted as a result of the development. See Koala Assessment Report for further impact assessment and recommendations.

Conclusion

The proposal is unlikely to have a significant impact on the Koala or areas of critical habitat for the species. The *Koala habitat assessment tool* (DotE; 2014) was used to determine the importance of habitat on site for the Koala. Targeted surveys resulted in no evidence of Koala activity within the site. See Koala Assessment Report for further impact assessment and recommendations.

13.6 Appendix VI – BDAR Requirements Compliance

Minimum information requirements for the Biodiversity Development Assessment Report: Streamlined assessment module – Small area		
Report section	**Information**	**Section in this report**
Introduction	Introduction to the biodiversity assessment including: - brief description of proposed development - identification of subject land boundary, including: - operational footprint - construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1
	General description of the subject land	Section 1.1
	Sources of information used in the assessment, including reports and spatial data	Section 1.4
	Identification of the assessment method applied (i.e. linear or site based)	Section 1.6
	Map of the subject land boundary showing final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1
Landscape	Identification of site context components and landscape features at the proposed site, including: - general description of subject land topographic and hydrological setting, geology and soils	Section 2
	- percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2(4.)	Table 2.1
	- IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Table 2.1
	Other relevant landscape features which may include: - Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3–4.) and Appendix E)	Table 2.1
	- wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(4.))	Table 2.1
	- connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Table 2.1
	- areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(10.)	Table 2.1

	- areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.)) MAPS and TABLES (in document	Table 2.1
	Site Map - boundary of subject land - cadastre of subject land - landscape features identified in BAM Subsection 3.1.3 - areas of outstanding biodiversity value within the subject land	Figure 1.2.
	Location Map - digital aerial photography at 1:1,000 scale or finer - boundary of subject land - 1500 m buffer area or 500 m buffer for linear development - landscape features identified in BAM Subsection 3.1.3 - additional detail (e.g. local government area boundaries) relevant at this scale - areas of outstanding biodiversity value within the assessment area	Figure 2.1
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map include: - IBRA bioregions and subregions - rivers, streams and estuaries - wetlands and important wetlands - connectivity of different areas of habitat - areas of geological significance and soil hazard features	Figure 2.2
	All report maps as separate jpeg files Individual digital shape files of: - subject land boundary - assessment area (i.e. buffer area) boundary - cadastral boundary of subject land - areas of native vegetation cover - areas of habitat connectivity	Provided to client
Native vegetation, TECs and	- Patch size (in accordance with BAM Subsection 4.3.2)	Section 3.1.1
	- Identification of the dominant PCT on the subject land and extent (ha) with justification of method used (existing information or plot-based survey data)	Section 3.1.1

vegetation integrity	- Identification of any TEC associated with the PCT (BAM Subsection 4.2.2)	Section 3.1.1 and table 3.1
	- Estimate of percent cleared value of dominant PCT (BAM Subsection 4.2.1(5.)	Table 3.1
	- Identification of any TEC on site that is not associated with the dominant PCT (Note: This TEC is required to be assessed and offset.)	Table 3.1
	- Equivalence with mapping units of previous vegetation maps reviewed as part of the assessment (i.e. equivalent mapping units)	Section 3.1
	- Vegetation integrity of the PCT(s) on the subject land as individual vegetation zones	Table 5.1
	- Justification for how this was determined (i.e. qualitatively by observing values for the condition attributes set out in Table 2 of the BAM or quantitatively by collecting field data for the condition attributes at a plot in accordance with BAM Subsection 4.3.4)	Section 5.1
	- Use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsections 4.3.3(5.))	Section 5.1
	Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A) - identify the PCT or vegetation class for which local benchmark data will be applied - identify published sources of local benchmark data (if benchmarks obtained from published sources) - describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) - provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	BioNet Vegetation Classification benchmark values used.
	- Map of native vegetation extent for the subject land (as described in BAM Section 3.1) - Map of PCT/vegetation zones within the subject land (as described in BAM Section 4.2(1.) - Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries - Map of TEC distribution on the subject land - Patch size of native vegetation (as described in BAM Subsection 4.3.2)	Figures 3.1, 3.2, 3.3, 3.5. Tables 5.1
	- Table of current vegetation integrity scores for vegetation zone within the site including: - composition condition score - structure condition score - function condition score - Report from BAM-C (Small area module) including vegetation integrity scores (BAM Section 4.4)	Tables 5.1, 5.2

	- All report maps as separate jpeg files Plot field data (MS Excel format) - Digital shape files for all maps and spatial data - Field data sheets (if relevant) for determining vegetation integrity (BAM Subsection 4.3.4)	Provided to client
Habitat suitability for threatened species	- Describe the review of existing information and any field survey undertaken to assess habitat constraints and microhabitats for threatened species within the subject land	Section 4
	- Determination of the suite of threatened species likely to occur on or use the proposed site according to Steps 1 and 2 in BAM Section 5.2 including species to be assessed for ecosystem credits and the list of species to be assessed for species credits	Tables 4.1, 4.2, 4.3.
	- List of ecosystem credit species derived from the TBDC (as described in BAM Subsections 5.2.1 and 5.2.2) with justification for the exclusion of any ecosystem credit species based on habitat constraints (as described in BAM Subsection 5.2.2)	Appendix I - Rationale for likelihood of occurrence
	Identification of candidate species credit species that are at risk of an SAII and therefore, must be further assessed (BAM Section 9.1) Note: Candidate species credit species that are not at risk of an SAII and not incidentally recorded on the subject land do not require further assessment. For candidate species credit species that are at risk of an SAII, a description of the species, any habitat constraints or microhabitats associated with the species on the subject land and information used to create the species polygon/s in accordance with Steps 3 to 5 of BAM Section 5.2 including: - justification for determining that a candidate species credit species at risk of an SAII is unlikely to have suitable habitat on the subject land or specific vegetation zone (based on a field assessment of the subject land and published literature or an expert report prepared in accordance with Box 3 of the BAM)	Section 8
	- determination of the presence of remaining candidate species credit species at risk of an SAII (by assuming presence, conducting a threatened species survey or an expert report). Note: If the subject land is mapped on an important habitat map for a species, or for a component of its habitat, the subject land is considered to have suitable habitat for the species to be present.	Section 8
	- species polygons identifying the location and area of suitable habitat for each candidate threatened species at risk of an SAII that is recorded on the subject land and is measured by area, OR	Appendix VII
	- species polygons identifying the area of suitable habitat and targeted surveys identifying the count and location of individuals on the subject land for each candidate threatened flora species at risk of an SAII that is recorded on the subject land and is measured by count	n/a no threatened flora species expected to occur on site.

	- species polygons for each threatened species identified on the subject land that is not at risk of an SAII (i.e. incidentally observed during site visit) Biodiversity Assessment Method 140 Report section BAM ref. Information Maps & tables (in document) Data (to be supplied)	n/a no threatened species observed during site visit.
	- Determination of habitat condition within species polygon/s for each threatened species (measured by area) at risk of an SAII or incidentally observed during the site visit (Step 6 of BAM Section 5.2)	Appendix VII
	- For flora species credit species at risk of an SAII or incidentally observed during site visit, provide a count, or an estimation, of the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(4.))	n/a no threatened flora species expected to occur within the site
	Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and:	Table 5.3
	- identifying any ecosystem credit species removed from the list of species on the basis of further assessment in accordance with BAM Subsections 5.2.2 and 5.2.3	All ecosystem credit species retained
	- identifying the sensitivity to gain class of each species (BAM Section 5.4)	Table 5.3
	- Table detailing species credit species within the subject land at risk of an SAII (BAM Section 9.1) or incidentally observed during the site visit including any associated habitat feature/components and its abundance (flora)/extent of habitat (flora and fauna) and biodiversity risk weighting (BAM Sections 5.2–5.4)	Section 5.2.2, Figure 5.2
	- Map of species credit species records within the subject land and species polygons for flora and fauna species at risk of an SAII or incidentally observed during the site visit (as described in BAM Subsection 5.2.5(1–7.))	Figure 5.5
	- Digital shape files of species polygons - Species polygon map in jpeg format - Expert reports and any supporting data used to support conclusions of the expert report - Field data sheets (if relevant) for threatened species surveys	Provided
Prescribed impacts	Any prescribed impacts from the small area proposal must be set out in the BDAR consistent with Appendix K	Section 9
	If relevant, maps showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, humanmade structures, etc.)	Table 8
	- If relevant, digital shape files of prescribed impact feature locations - Prescribed impact features map in jpeg format	Not relevant.

Avoid and minimise impacts	Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: - modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology - alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location - alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site - Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Subsections 7.1.2 and 7.2.2 - Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.)	Section 10
	- Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility - Map of final proposal footprint, including construction and operation - Maps demonstrating indirect impact zones where applicable	Table 11
	Digital shape files of: - final proposal footprint - direct and indirect impact zones - Maps in jpeg format	Provided to client
Assessment of Impacts	Determine the impacts on native vegetation and threatened species habitat, including: - description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Sections 8.1) - description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal (as described in BAM Subsection 8.2	Section 6, 7
	- Any prescribed impacts from the small area proposal must be set out in the BDAR consistent with Appendix K	Section 9
	Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 5.1
Mitigation and Management of Impacts	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Subsections 8.4.1 and 8.4.2, including (as described in BAM Subsection 8.4.1(2.): - techniques, timing, frequency and responsibility - identify measures for which there is risk of failure	Section 11.

	- evaluate the risk and consequence of any residual impacts - document any adaptive management strategy proposed - mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	
	Identification of measures for mitigating impacts related to: - displacement of resident fauna (as described in BAM Subsection 8.4.1) - indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	Section 11
	Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Section 11
	Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 11
Thresholds for assessing and offsetting the impacts of the proposal	Information from the TBDC and/or other sources to report on the current status of threatened species, threatened populations at risk of an SAII and TEC/s for the proposal, and	Section 8
	Report on impacts of the proposal on TEC/s in accordance with BAM Subsection 9.2.1	Section 8
	Report on impacts of the proposal on threatened species and/or threatened populations at risk of an SAII in accordance with BAM Section 9.1	Section 8
	Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 12
	Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Section 12
	Identification of areas not requiring assessment in accordance with BAM Section 9.3	Section 12
	Map showing the extent of TECs at risk of an SAII within the subject land Map showing the location of threatened species at risk of an SAII within the subject land Map showing location of: - impacts requiring offset - impacts not requiring offset - areas not requiring assessment	Figure 3.2 figure 13.2
	Digital shape files of: - extent of TECs at risk of an SAII within the subject land - threatened species at risk of an SAII within the subject land - boundary of impacts requiring offset - boundary of impacts not requiring offset - boundary of areas not requiring assessment - Maps in jpeg format	Provided to client

Applying the no net loss standard	Description of the impact on PCTs/TECs	Section 8
	Description of the impact on threatened species at risk of an SAII or incidentally observed via site visit	Section 8
	Number of ecosystem credits required for impacts on biodiversity values according to BAM Subsection 9	Section 5.2, Appendix IV
	Number of species credits required for impacts on biodiversity values according to BAM Subsection 10.1.3, including any species credit species that has been incidentally observed on the subject land	Section 5.2, Appendix IV
	Note: Species credits for any species at risk of an SAII are calculated in the event that the decision-maker forms the opinion that the proposed impact is unlikely to be serious and irreversible and therefore can be offset. - Identification of credit class for ecosystem credits and species credits according to BAM Section 10.2 (this can be generated from BAM-C)	Appendix IV
	Table showing biodiversity risk weightings	Appendix IV
	Table of PCTs requiring offset and number of ecosystem credits required (Subsection 10.2.1)	Appendix IV
	Table of BC Act listing status for PCTs and threatened species requiring offset	Appendix IV
	Table of species at risk of an SAII or incidentally observed on site assessed for species credits and the number of credits required	Appendix IV
	BAM-C credit report	Appendix IV

13.7 Appendix VII – Species Polygon

Figure 13.1 Large-eared Pied Bat Species Polygon

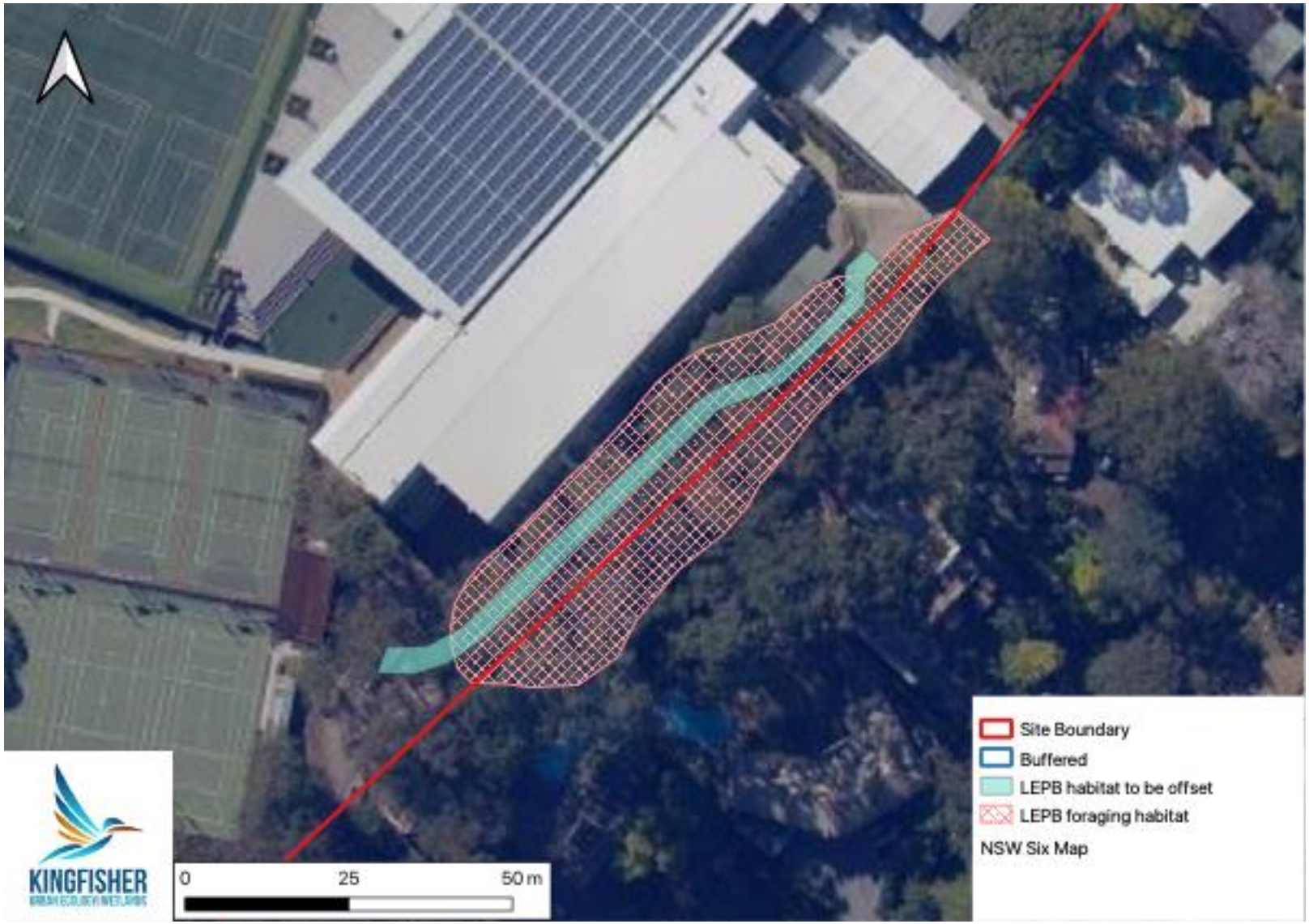

Figure 13.2 Sydney Turpentine Ironbark Forest Offset Polygon

14 Expertise of authors

Geraldene Dalby-Ball
DIRECTOR

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.

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

Luke Johnson
ECOLOGIST

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 though 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

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