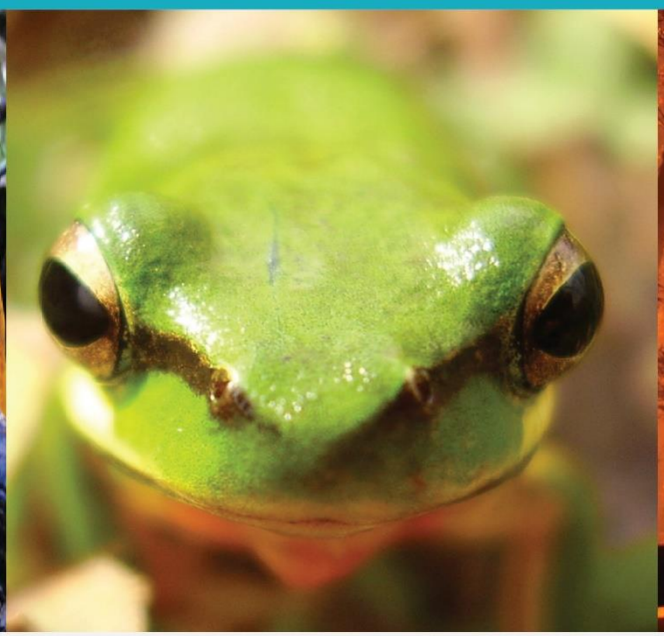
TRAVERS BUSHFIRE & ECOLOGY

A TBE ENVIRONMENTAL COMPANY


BIODIVERSITY ASSESSMENT REPORT

Proposed Development

Lot 1, DP 1246952

264-270 Mount Vernon Road

Mount Vernon

29 October 2021

(REF: 18BATH61.2)

www.traversecology.com.au

BIODIVERSITY ASSESSMENT REPORT

Proposed Residential Development

Lot 1, DP 1246952, 264-270 Mount Vernon Road, Mount Vernon

Report authors:	Lindsay Holmes B. Sc. – Manager of Ecology – Accredited Assessor no. BAAS17032 Geoffrey Coates B. Sc. (Hons.), B. Zool. – Fauna Ecologist Corrine Edwards B. Env. Sc. Mgmt. (Hons) – Fauna Ecologist
Flora survey:	Lindsay Holmes B. Sc. – Manager of Ecology – Accredited Assessor no. BAAS17032
Fauna survey:	Geoffrey Coates B. Sc. (Hons.), B. Zool. – Fauna Ecologist Corrine Edwards B. Env. Sc. Mgmt. (Hons) – Fauna Ecologist
Plans prepared:	Sandy Cardow B. Sc. Angelene Wright B. Sc.
Approved by:	Lindsay Holmes (Accredited Assessor no. BAAS17032)
Date:	29/10/21
File:	18BATH61.2

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

LIST OF ABBREVIATIONS

APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act (2016)*
BC Reg	*Biodiversity Conservation Regulation (2017)*
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BPA	bushfire protection assessment
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically endangered ecological community
CM Act	*Coastal Management Act 2016*
DAWE	Department of Agriculture, Water and the Environment.
DCP	development control plan
DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)
DOEE	Commonwealth Department of Environment & Energy (superseded by DAWE)
DPIE	NSW Department of Planning, Industry and Environment
EEC	endangered ecological community
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act (1979)*
EPBC Act	*Environment Protection and Biodiversity Conservation Act (1999)*
FM Act	*Fisheries Management Act*
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	local environmental plan
LGA	local government area
LLS Act	*Local Land Services Act (2013*)
NES	national environmental significance
NPW Act	*National Parks and Wildlife Act (1974)*
NRAR	Natural Resources Access Regulator (NSW)
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage (superseded by DPIE from August 2019)
PCT	plant community type
PFC	projected foliage cover
RFS	NSW Rural Fire Service
ROTAP	rare or threatened Australian plants
SAII	Serious And Irreversible Impacts
SEPP	State Environmental Planning Policy
SEWPAC	Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DOEE)
SIS	species impact statement
SULE	safe useful life expectancy
TEC	threatened ecological community
TPZ	tree preservation zone
TSC Act	*Threatened Species Conservation Act (1995) – Superseded by the Biodiversity Conservation Act (2016)*
VMP	vegetation management plan

TABLE OF CONTENTS

Figures

Tables

Appendices

1. BACKGROUND

Travers bushfire & ecology has been engaged to undertake a biodiversity development / constraints assessment within within Lot 1, DP 1246952, at 264-270 Mount Vernon Road, Mount Vernon within Council local government area (LGA)The extent of this entire lot is shown in Figure 1 below. This lot is subject to a proposed industrial development application and will hereafter be referred to as the 'study area'.

The area containing the proposed development, APZs and all associated impact on habitat features is hereafter referred to as the 'development footprint' (refer to Figure 4).

The proposal shall be assessed under the *Biodiversity Conservation Act* (*BC Act*), 2016.

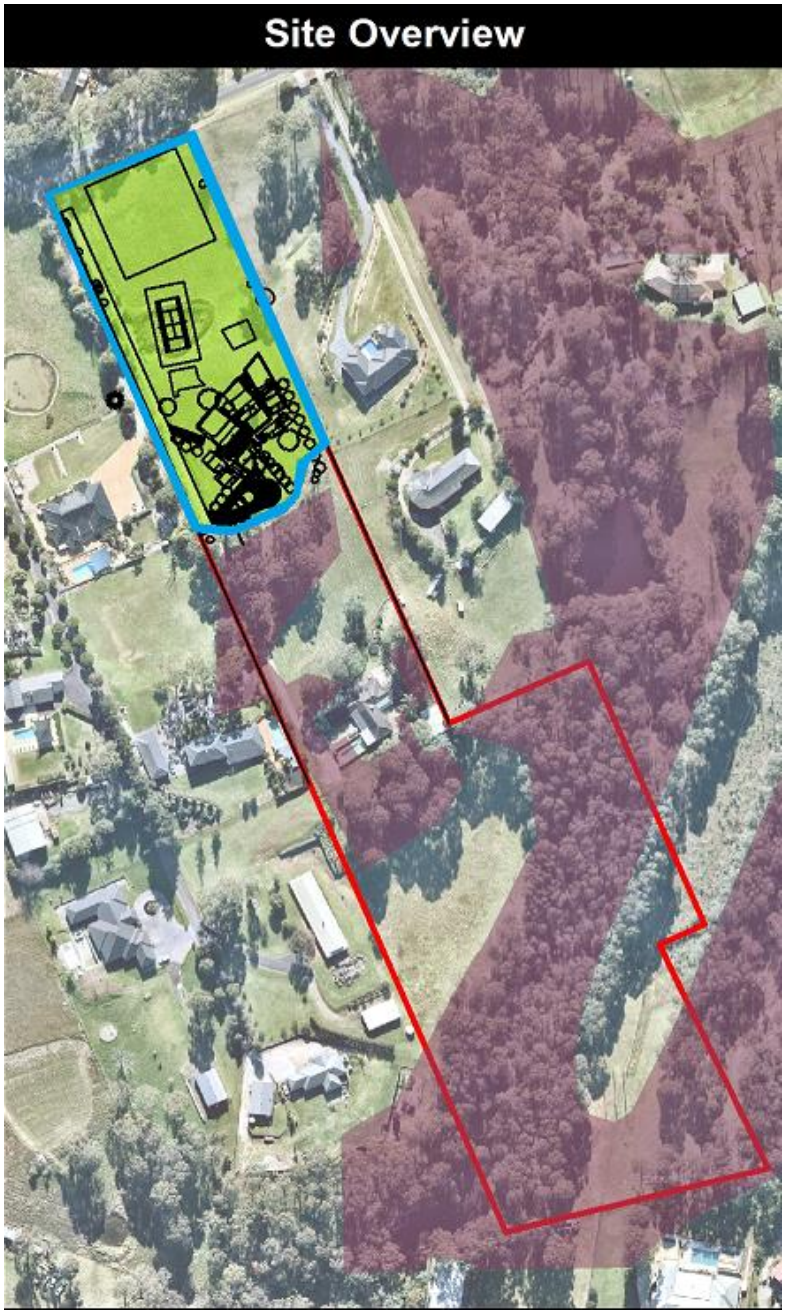


Figure 1 - Study area (red), development footprint (blue) and biodiversity values land (pink)

1.1 Proposed development

The current proposal involves the creation of involves the construction of a new dwelling within Lot 1, DP 1246952, Mount Vernon.

The application seeks development consent involving the construction of a two-storey dwelling and a secondary dwelling including roads, landscaping stormwater drainage and associated site works.

The proposal seeks consent for the following:

- Demolition of Existing Structures
- Construction of a Two storey dwelling house inclusive of basement garage, attached guest bedroom rooms, home office, indoor pool, gym and related landscaping;
- Construction of a secondary dwelling proposed to be utilised as staff quarters;
- Construction of ancillary structures including at grade parking, driveway and hardstand areas including tennis court and associated pavilion structures;
- Construction of private road; and
- Stormwater drainage and associated site works.

The proposed Class 1a building will be constructed as follows:

- Cladding is colorbond and rammed earth;
- Roof is colorbond;
- BAL flame zone rating shutters will be applied to all windows and doors;
- Suspended concrete slab beck with steel deck railing; and
- Retaining walls will be sandstone or concrete block.

Figure 2 shows the proposed site layout. Please note however, the red line that marks the APZ has been updated and reduced in size since these plans were drawn. The APZ line no longer intercepts the mapped biodiversity values land.

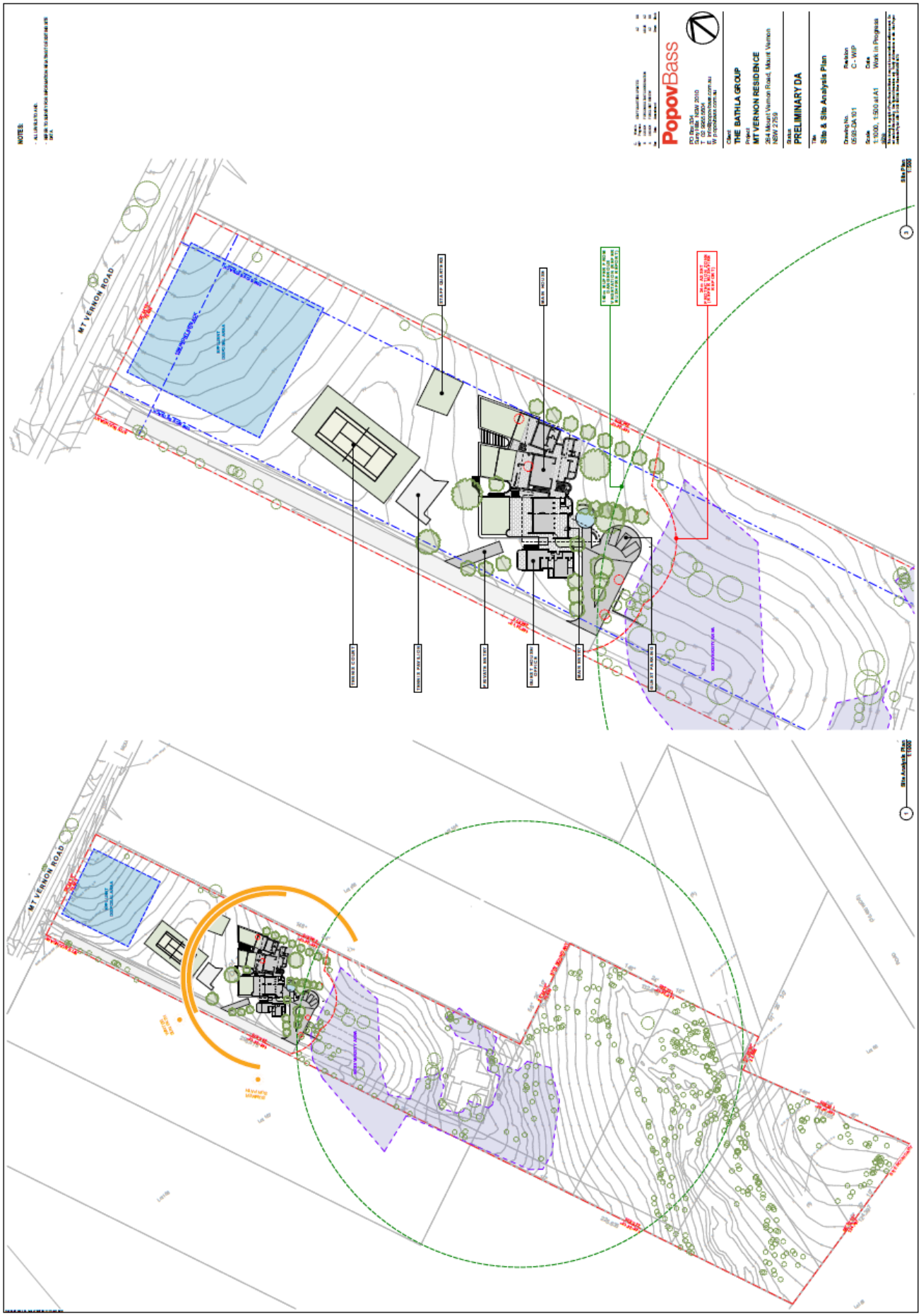


Figure 2 – Proposed development

1.2 Site description

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the development footprint.

Table 1– Site features

Location	264-270 Mount Vernon Road Mount Vernon, Lot 1, DP 1246952)
Area	Approximately 5.19 ha
Development footprint	1.1 ha approximately
Local government area	City of Penrith
Zoning	E4 – Environmental living
Grid reference	297650E 6249650N MGA-56
Elevation	Approximately 65-85 m AHD
Topography	Gentle to moderate slopes occur across the lot. Within the development footprint, the slopes are gentle, mostly below 5 degrees and with a westerly aspect.
Geology and soils	Geology: Bringelly Shale Soils: Luddenham Soil Landscape
Catchment, drainage and steam order	The dam is not connected to any mapped watercourses. The watercourse in the southern portion of the lot is a 1st and 2nd order tributary (unnamed) of Kemps Creek.
Existing land use	Rural residential property with grazing by goats, deer and horses.
Connectivity features	There is some degree of fragmented arboreal connectivity to the south towards remnant and regrowth larger woodland parcels to the south of Elizabeth Drive.

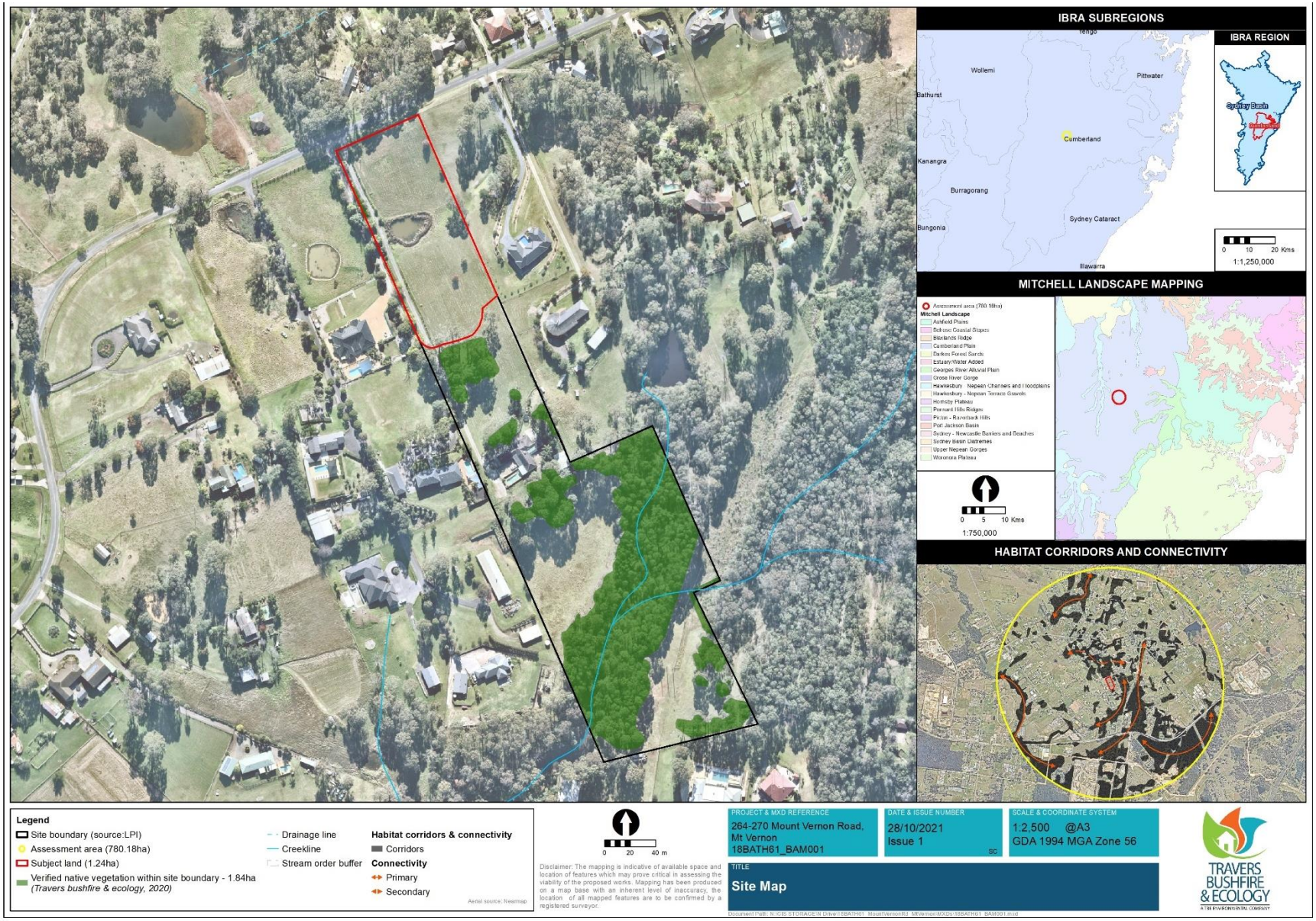


Figure 3 – Site map

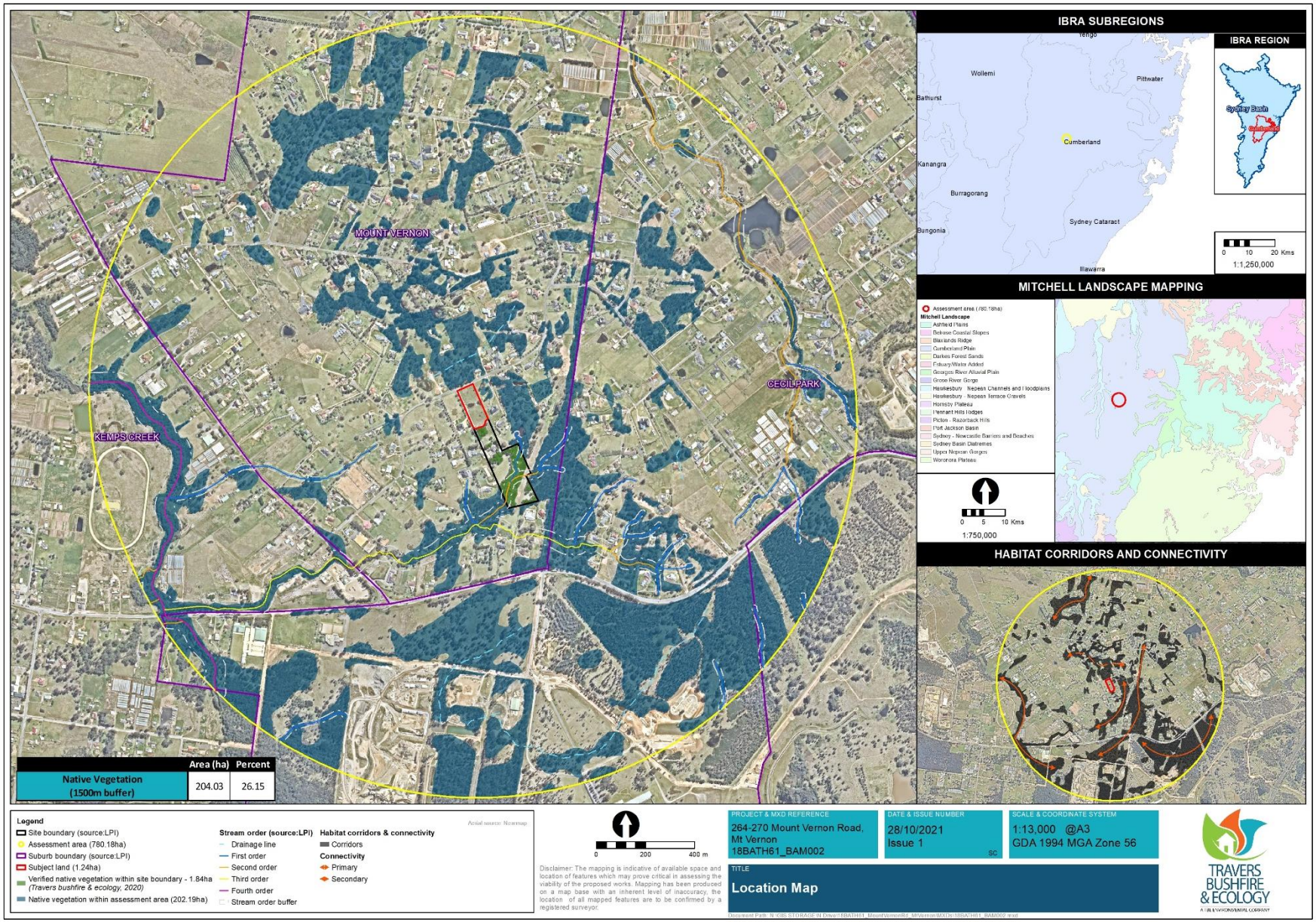


Figure 4 - Location map

2. FLORA

2.1 Survey

Standard technical resources utilised:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities 2004* (working draft), Department of Environment and Conservation (DEC)
- Aerial photographs (Google Earth Pro / Spatial Information Exchange / NearMap)
- Topographical maps (scale 1:25,000)
- *Biodiversity Conservation Act 2016* (*BC Act*)
- *Fisheries Management Act 1994* (*FM Act*)
- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*)
- Rare or Threatened Australian Plants (ROTAP)
- Local environmental plans
- NPWS 2002 Vegetation Mapping of the Cumberland Plain
- OEH 2013 Remnant Vegetation of the Western Cumberland Plain Subregion
- DPIE 2020 Surveying Threatened Plants and their Habitats.

Botanical survey was undertaken on 14 October 2021 over a time frame of approximately 3.5 hrs.

Botanical survey included a random meander in accordance with Cropper (1993) to gain a full species list of the plants across the development footprint area and immediate surrounds. One (1) BAM quadrat of 0.1 ha (20x20/50x20m) was undertaken within the remnant tree area adjacent to the proposed asset protection zone (APZ). One (1) standard 20x20m quadrat was undertaken over the dam area. A review of the Atlas of NSW Wildlife (DPIE 2021 - October) was undertaken prior to the site visit to determine threatened species previously recorded within 10 km of the development footprint, and relevant target searches were undertaken as suited, generally as near-linear transects underneath or adjacent to remnant canopy vegetation.

All naturally occurring species were identified to species level where possible, and are listed in Appendix 1.

Botanical survey across the full extent of the site was undertaken by this firm on 19 May 2017 which included random meanders, target searches for *Pimelea spicata* and five (5) biometric transect plots. Only current survey effort is shown on Figure 6.

2.2 Vegetation communities

Desktop analysis

The OEH maps (2013); Cumberland Plain West; show the vegetation as Shale Hills Woodland which is equivalent to PCT 850 - Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion. The local mapping is shown on Figure 5. The dam was not mapped as being a vegetation community.

Ground-truthing

One (1) BAM quadrat was undertaken within the small vegetation patch adjoining the proposed APZ. The plot data was put through the Bionet Vegetation Classification Tool to

assist in determining the most appropriate plant community type (PCT) present. All native species from the quadrat were added, and any PCT with 6 or more indicator species are listed below in **Table 2 – Shortlist of PCTs**Table 2**.** Justification as to whether or not the PCT is present, can be viewed in the right-hand column.

Table 2 – Shortlist of PCTs

PCT ID	Formation	Class	Common Name	Justification
434	Grassy Woodlands	Western Slopes Grassy Woodlands	White Box grass shrub hill woodland on clay to loam soils on volcanic and sedimentary hills in the southern Brigalow Belt South Bioregion	Incorrect vegetation class, not in Cumberland subregion
599	Grassy Woodlands	Western Slopes Grassy Woodlands	Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	Incorrect vegetation class, not in Cumberland subregion
399	Dry Sclerophyll Forests (Shrubby sub-formation)	Western Slopes Dry Sclerophyll Forests	Red gum - Rough-barked Apple +/- tea tree sandy creek woodland (wetland) in the Pilliga - Goonoo sandstone forests, Brigalow Belt South Bioregion	Incorrect vegetation class, not in Cumberland subregion
830	Grassy Woodlands	Coastal Valley Grassy Woodlands	Cumberland moist shale woodland	Mesic elements absent
850	Grassy Woodlands	Coastal Valley Grassy Woodlands	Cumberland shale hills woodland	Correct landscape features and, right location. Acacia implexa present (although outside of the quadrat)
373	Dry Sclerophyll Forests (Shrubby sub-formation)	Yetman Dry Sclerophyll Forests	Narrow-leaved Ironbark - White Cypress Pine +/- Buloke tall open forest or woodland of the Warialda to Yetman region, Brigalow Belt South Bioregion	Incorrect vegetation class, not in Cumberland subregion
393	Dry Sclerophyll Forests (Shrub/grass sub-formation)	North-west Slopes Dry Sclerophyll Woodlands	White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion	Incorrect vegetation class, not in Cumberland subregion
492	Grassy Woodlands	New England Grassy Woodlands	Silvertop Stringybark - Yellow Box - Apple Box - Rough-barked Apple shrub grass open forest mainly on southern slopes of the Liverpool Range, Brigalow Belt South Bioregion	Incorrect vegetation class, not in Cumberland subregion
511	Grassy Woodlands	Western Slopes Grassy Woodlands	Queensland Bluegrass - Redleg Grass - Rats Tail Grass - spear grass - panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Incorrect vegetation class, not in Cumberland subregion

PCT ID	Formation	Class	Common Name	Justification
618	Grassy Woodlands	Coastal Valley Grassy Woodlands	White Box x Grey Box - red gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	Not in Cumberland subregion
621	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Hinterland Dry Sclerophyll Forests	Grey Gum - Rough-barked Apple alluvial flat woodland in the upper Hunter Valley, mainly Sydney Basin Bioregion	Incorrect vegetation class, not in Cumberland subregion
835	Forested Wetlands	Coastal Floodplain Wetlands	Cumberland riverflat forest	Not on a floodplain
1800	Forested Wetlands	Coastal Floodplain Wetlands	Cumberland Swamp Oak riparian forest	Not on a floodplain
1847	Wet Sclerophyll Forests (Grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests	Sydney Foreshores shale forest	Incorrect vegetation class

For the dam which contains largely *Typha orientalis,* PCT 1071 - Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion is typically assigned to this vegetation type and state. In a natural state, it would likely be regarded as one of the listed *BC Act* freshwater wetland threatened ecological communities, however constructed dams should not be considered as part of those freshwater wetland communities as they are typically depauperate.

Figure 5 – Former OEH 2013 mapping of the site and surrounds

PCT 850 description from Bionet Vegetation Classification

PCT scientific name - Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion

Vegetation formation – Grassy Woodlands

Vegetation Class – Coastal Valley Grassy Woodlands

Upper stratum – *Acacia implexa, Eucalyptus moluccana, Eucalyptus tereticornis*

Middle stratum – *Bursaria spinosa, Rubus parvifolius*

Ground stratum – *Dichondra repens, Brunoniella australis, Desmodium gunnii, Aristida ramose, Microlaena stipoides* var. *stipoides, Carex inversa, Themeda triandra, Cyperus gracilis, Dichelachne micrantha, Asperula confera, Oxalis perennans, Cheilanthes sieberi* susbp. *sieberi, Desmodium brachypodum, Sporobolus creber, Wahlenbergia gracilis.*

Description of observed vegetation

PCT 850 (remnant woodland vegetation)

Upper stratum – *Eucalyptus tereticornis. Acacia implexa* – mostly 14-22m in height. Within the BAM plot (no. 1), the projected foliage cover was 40%.

Middle stratum – Generally absent or <5% coverage with non-native species.

Ground stratum – Common native species include *Themeda triandra, Dichondra repens, Microlaena stipoides* var. *stipoides, Einadia nutans, Cynodon dactylon, Chloris ventricosa* and *Asperula conferta.* Common exotic species include *Sida rhombifolia, Ehrharta erecta, Solanum pseudocapsicum, Senecio madagascariensis, Cirsium vulgare, Verbena bonariensis* and *Paspalum urvellei.*

Photo 1 – Remnant Eucalyptus tereticornis with managed understorey where the botanical plot was undertaken immediately south of the proposed APZ and within biodiversity values mapped land

PCT 1071 (dam and embankment vegetation)

There is a small dam located in the northern portion of the site approximately 50 m from the northern boundary. The dam is a relatively open waterbody that has been constructed with fringing *Typha orientalis.* Native vegetation is pretty limited on the embankment with a small amount of *Juncus usitatus* and *Themeda triandra* being the main native species present. Exotic grasses and herbs otherwise dominate the embankment.

This vegetation unit is not commensurate with the *BC Act* listing for Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and SE Corner Bioregions or Sydney Freshwater Wetlands in the Sydney Basin Bioregion as it is not naturally occurring and lacks the presence or other native macrophytes. The presence of the *Typha orientalis* is opportunistic.

Photo 2 – Dam with fringing macrophyte vegetation

Other vegetation

The grassy areas contain >90% non-native species, dominated by pasture grasses and annual or perennial herbs within the development footprint. It was noted that grazed vegetation that occurred south of the existing residence (immediately north of the riparian zone however well outside of the development footprint) contained 25-30% native groundcover coverage including *Microlaena stipoides* var. *stipoides, Aristida vagans, Eragrostis brownii, Themeda triandra, Epaltes australis, Hypericum gramineum* and *Dichondra repens.*

Landscape occurs along the western site boundary along the existing driveway. Non-native species cover >90% of the area. Some examples of species include *Agapanthus praecox, Pelargonium sp., Jacaranda mimosifolia, Quercus robur, Cestrum parqui, Celtis sinensis, Erythrina sykesii, Acacia implexa* and *Ligustrum lucidum.*

Photo 3 – An example of the planted and weedy vegetation along the driveway

2.3 Threatened flora species

BC Act – A search of the Atlas of NSW Wildlife (DPIE, 2021) indicated a list of species that have been recorded within a 10 km radius of the development footprint. These species are listed in Table 8 (Appendix 2) and are considered for potential habitat within the development footprint.

EPBC Act – A review of the schedules of the *EPBC Act* indicated the potential for a list of threatened flora species to occur within a 10 km radius of the development footprint. These species have also been listed in Table 8 for consideration of potential to occur.

Based on the habitat assessment within Table 9 (Appendix 2) it is considered that the development footprint provides potential habitat for the following threatened flora species. These species will be considered in the test of significance within Appendix 3:

Table 3 - Threatened flora species with suitable habitat present

Scientific name	*BC Act*	*EPBC Act*	Potential to occur
Acacia pubescens	V	V	Low habitat potential due to previous disturbances, considered unlikely to occur

Scientific name	*BC Act*	*EPBC Act*	Potential to occur
Dillwynia tenuifolia	V	-	Low habitat potential due to previous disturbances, considered unlikely to occur
Grevillea parviflora subsp. *parviflora*	V	V	Low habitat potential due to previous disturbances, considered unlikely to occur
Pimelea spicata	E1	E	Moderate potential due to previous disturbances. Can occur in grassy areas near remnant patches of overstorey vegetation
Pultenaea parviflora	E1	V	Low habitat potential due to previous disturbances, considered unlikely to occur

The development footprint will not likely require the removal of any remnant Cumberland Plain Woodland vegetation on site. The asset protection zone for the development has been reduced to the south of the proposed dwelling to avoid impacts on remnant vegetation which is mapped as having biodiversity values. Remnant woodland occurs outside of the development footprint and can be retained insitu.

The development footprint is open grassland with >90% cover with pasture species or exotics. These areas are regularly maintained / mown, and there is no regeneration of the woodland occurring outside of mapped remnants within or immediately adjacent to the development footprint.

The habitat suitability for threatened species in areas without overstorey vegetation is considered low.

Acacia pubescens can grow in disturbed locations, and being a larger species (a shrub), it may have been retained. No specimens were observed during the field surveys.

Dillwynia tenuifolia occurs very abundantly approximately 2-3 km to the west of the site in Kemps Creek and also forms an endangered population in this suburb. Specimens of *Dillwynia tenuifolia* regularly occur on the outer edges of remnant patches of vegetation, however they are common in Shale-Gravel Transition Forest and Castlereagh vegetation communities on tertiary alluvium rather than Cumberland Plain Woodland. No specimens were observed during the field surveys.

Grevillea parviflora subsp. *parviflora* does not occur in high numbers in the locality. There are eighteen (18) records within a 10 km radius of the site with all located in Kemps Creek 2-3 km to the west. The soil substrate in the known area of occurrence is different to that which occurs on site. The species is known to occur sporadically on the Cumberland Plain, however given the lack of native vegetation in the development footprint, it was considered unlikely to occur. No specimens were observed during the field surveys.

Pimelea spicata occurs mostly within Cumberland Plain Woodland vegetation which occurs on site. There are only a handful of remnant trees within the development footprint with almost no native understorey. The ongoing mowing would diminish the potential for the species to occur. Target surveys in near-linear transects were undertaken on site from Mt Vernon Road, south to just beyond the proposed APZ. No specimens were observed during the field surveys.

Pultenaea parviflora regularly occurs in similar locations to that of *Dillwynia tenuifolia.* It can occur in Cumberland Plain Woodland but often prefers Shale-Gravel Transition Forest and Castlereagh ecological communities on tertiary alluvium. No specimens were observed during the field surveys.

All other listed threatened species entities in both the BioNet (NSW) and *EPBC Act* coordinate search (National) were considered to have no potential suitable habitat within the development footprint due to ongoing land management practices, unsuitable soils / geology, unsuitable previous vegetation type or large distance to known specimens.

Conclusions

No threatened flora species have been detected during previous surveys in 2017, or during October 2021 surveys. A test of significance would conclude a not significant impact on all threatened flora species entities being considered.

2.4 Endangered flora populations

There are two (2) endangered flora populations within the Penrith LGA. These are:

- *Marsdenia viridiflora* subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas
- *Dillwynia tenuifolia,* Kemps Creek population

Marsdenia viridiflora subsp. *viridiflora* prefers vine thickets on shale geology, often associated with Cumberland Plain Woodland, River-flat Eucalypt Forest on Coastal Floodplains and occasionally on the edges of dry rainforest communities on the ridges around south-west Sydney. The site occurs within the Penrith LGA therefore the endangered population must be considered.

The ongoing management of the understorey would likely limit the potential for any habitat on site. No specimens were observed during the survey.

Dillwynia tenuifolia population of Kemps Creek – The study area is not located in Kemps Creek. The majority of the population in Kemps Creek occurs where the Berkshire Soil Landscape is prominent. This is a very isolated patch of this soil landscape where the corresponding vegetation types are also isolated, including Shale Gravel Transition Forest, Castlereagh Swamp Woodland, Cooks River - Castlereagh Ironbark Forest and Castlereagh Scribbly Gum Woodland. None of these communities occur within the study area or immediately adjacent. No specimens of the endangered populations were expected to occur within the study area.

2.5 Threatened ecological communities

BC Act

PCT 850 - Cumberland shale hills woodland is equivalent to the critically endangered community, Cumberland Plain Woodland. The occurrence within the lot boundary is approximately 1.94 ha.

All woodland remnants within the lot boundary are located outside of the development footprint. There will be no direct impacts on Cumberland Plain Woodland. Areas of remnant vegetation may be protected by permanent fencing to restrict trampling of emerging vegetation or over-clearing through mowing and maintenance activities.

Whilst the importance of the small patches on site outside of the development footprint are not high due to the impacted ground layer, limited number of native species and regeneration, weeds, edge effects and fragmentation, DPIE have marked the remnant patch of vegetation immediately south of the APZ as having biodiversity values.

Where patches of vegetation are mapped as having biodiversity values, this means automatic entry into the Biodiversity Offset Scheme unless a map review is undertaken. The bushfire protection assessment has been updated to reflect a smaller APZ of 16 m to the south of the dwelling rather than 24 m. The 24 m APZ would have overlapped the biodiversity values land by ~5 m. The report has been updated to reflect a better outcome ecologically that has produced a smaller APZ to ensure no impact on biodiversity values land.

PCT 1071 - Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion occurs in the form of dam vegetation with fringing macrophytes. In a natural state, the vegetation may be considered as one (1) of two (2) threatened ecological communities, Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and SE Corner Bioregions or Sydney Freshwater Wetlands in the Sydney Basin Bioregion. Where dams have been constructed and *Typha orientalis* dominates, this would not be considered to be representative of either threatened ecological community.

EPBC Act

PCT 850 can be a derivative of the *EPBC* listed critically endangered ecological community Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. Given there is no PCT 850 being directly removed by the proposal, there is no direct impact on any *EPBC* listed vegetation.

To be commensurate with the *EPBC* listing, the vegetation remnants must reach particular thresholds on size classes, proportion of perennial understorey vegetation. Outlier remnants within the lot boundary are unlikely to conform to the national listing. The vegetation within the riparian zone to the south of the development would meet the condition thresholds for listing under the *EPBC Act.* There is sufficient separation between the development and remnant Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest such that the proposal will not reduce the area of occupation, fragment the community or impact abiotic features of importance to the survival of the patch. The proposal will not have a significant impact on the entity nor will require a referral to DAWE.

PCT 1071 does not correspond to any nationally listed threatened ecological communities.

2.6 SEPP (Vegetation in Non-Rural Areas) 2017

The State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 (Vegetation SEPP) was one of a suite of Land Management and Biodiversity Conservation (LMBC) reforms that commenced in New South Wales on 25 August 2017. The Vegetation SEPP (the SEPP) works together with the *BC Act* and the *Local Land Services Amendment Act 2016* to create a framework for the regulation of clearing of native vegetation in NSW.

As ‘development consent’ is required for the proposed works the Vegetation SEPP does not apply.

3. FAUNA

3.1 Survey

Fauna survey including afternoon diurnal survey, nocturnal survey and threatened species habitat assessment was undertaken within the subject site and nearby surrounds on 6th October 2021.

Diurnal fauna survey included:

- frog and reptile habitat searches,
- 3x bird census points (out to a radius of 30-50 m for 15 minutes)
- opportunistic bird call and activity survey between census points
- mammal activity searches (scats, scratches, diggings, burrows, etc.)
- habitat tree survey, and
- significant habitat tree survey

Significant habitat trees are defined as trees containing large hollows suitable for owls/cockatoos and/or two or more good quality medium hollows and/or several small hollows and/or a tree showing notable use by a threatened species (e.g. sap feed tree, raptor nest tree, microbat roost, etc.).

Weather conditions at the time of diurnal survey were 0/8 cloud, slight NE wind, no rain, 24-18°C between 15:29 – 19:05.

Nocturnal fauna survey included:

- spotlighting,
- frog call identification,
- ultrasonic microbat recording (x2 passive recording stations),
- owl call-playback (Powerful Owl, Masked Owl, & Barking Owl), and
- stag watching of significant habitat tree (HT1)

Weather conditions at the time of nocturnal survey were 2/8 cloud, slight ESE wind, no rain, 0% moon, 18-15°C between 19:05 – 21:10.

Specific survey effort locations and results are shown on Figure 6. All fauna species recorded during survey within the development footprint and nearby surrounds are listed in Table 9 (Appendix 2).

A review of the Atlas of NSW Wildlife (DPIE 2021) was undertaken prior to the site visit to determine threatened species previously recorded within 10km of the development footprint.

3.2 Habitat features

The following notable habitat features were observed present:

- One (1) significant habitat tree containing good quality medium hollows, each showing signs of use.
- Year-round nectar producing tree species, principally Eucalyptus sp.
- Ephemeral drainage line with rock boulders in upper reaches

- Dense mid and upper-storey foliage areas predominately in the riparian zone to the south of the development footprint
- Occasional leaf litter and logs on the ground
- Drainage line with ephemeral still water south of the development footprint within the southern portion of the lot

One large hollow-bearing tree within the riparian zone to the south of the development footprint contained a large hollow as well as several other medium and small high-quality hollows. This tree was stag-watched to confirm unlikely utilisation by large forest owls. Unlikely use of this hollow by forest owls was confirmed based on the presence of two Common Brushtail Possums, no signs of surrounding owl perch use and generally unsuitable surrounding habitat.

The tree that was stag-watched included;

- 2x 0-5cm branch spout
- 1x 5-10cm trunk
- 3x 5-10cm branch spout
- 2x 10-15cm trunk (good)
- 2x 10-15cm branch spout
- 1x 30-40cm trunk (good)

The recorded hollows may however be suitable for hollow-dependent threatened species with considered potential and known to occur within the study site include:

- East-coast Freetail Bat
- Southern Myotis
- Eastern False Pipistrelle
- Little Bent-wing Bat
- Greater Broad-nosed Bat

Therefore, the assessment for this species has recommended retention of hollows where possible within the development landscape.

3.3 Threatened fauna species

BC Act – A search of the Atlas of NSW Wildlife (DPIE, 2021) provided a list of threatened fauna species previously recorded within a 10km radius of the development footprint. These species are listed in Table 9 (Appendix 2) and are considered for potential habitat within the study area.

EPBC Act – A review of the schedules of the *EPBC Act* identified a list of threatened fauna species or species habitat likely to occur within a 10km radius of the development footprint. These species have also been listed in Table 9.

In accordance with Table 9 (Appendix 2) the following state and nationally listed threatened fauna species are considered to have suitable habitat with varying potential to occur within the study area. The state listed species will be considered in the test of significance (Appendix 3):

Table 4 - Threatened fauna species with suitable habitat present

Common name	*BC Act*	*EPBC Act*	Potential to occur
Grey-headed Flying-fox	V	V	Recorded
Greater Broad-nosed Bat	V	-	Recorded
Southern Myotis	V	-	Recorded
Little Bent-winged Bat	V	-	Recorded
Eastern Coastal Free-tailed Bat	V	-	Recorded
Cumberland Plain Land Snail	E	-	Recorded south of the development footprint
Little Eagle	V	-	Yes
Swift Parrot	E	E	Yes
Eastern Falsistrelle	V	-	Yes
Large Bentwing-bat	V	-	Yes
Square-tailed Kite	V	-	low
Little Lorikeet	V	-	low
Varied Sittella	V	-	low
Dusky Woodswallow	V	-	low
Yellow-bellied Sheathtail-bat	V	-	low
Powerful Owl	V	-	unlikely
Masked Owl	V	-	unlikely
Speckled Warbler	V	-	unlikely
Regent Honeyeater	E4A	CE	unlikely

The state test of significance assessment (Appendix 3) and a review of EPBC impact criteria (Appendix 5) has concluded that the proposed development will not have a significant impact on threatened fauna species. Therefore, (a) a Species Impact Statement is not required in respect to fauna for the proposal and (b) biodiversity offsetting is not required.

Fisheries Management Act (*FM Act*) – No habitats suitable for threatened aquatic species were observed within the study area and as such the provisions of this act do not require any further consideration.

3.4 Protected migratory species (National)

The *EPBC Act* Protected Matters Report provides additionally listed terrestrial, wetland and marine migratory species of national significance likely to occur, or with habitat for these species likely to occur, within a 10km radius of the development footprint. The habitat potential of migratory species is considered in Table 10 (Appendix 2). The habitat potential of threatened

migratory species are instead considered with other threatened species in Table 9 (Appendix 2).

No nationally protected migratory bird species were recorded present within the study area during survey.

3.5 Endangered fauna populations

There are no endangered fauna populations within the City of Penrith LGA; however, the site does fall within the Sydney Metropolitan Catchment Management Authority area. An endangered population of White-fronted Chat (*Epthianura albifrons*) is identified to this area; however, this is made up of two known isolated sub-populations; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. The subject site does not provide any suitable habitat for this species.

3.6 State Environmental Planning Policy (Koala Habitat Protection) 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP 2021) applies to land within LGAs listed under Schedule 1 of the Policy. As the study area falls under the Penrith LGA, which is not listed under Schedule 1, it is considered that Koala SEPP 2021 does not apply to this development proposal. Therefore, the overarching legislative document relating to Koalas will be the BC Act.

As of October 2021, the nearest Koala sightings in relation to the study area were recorded in 2002 and 2003, approximately 9.9 km to the south east of site. These are the only known records of Koala sightings within 10 km radius of the study site. Koala populations present outside of a 10km radius of the study site are sparse, and highly sporadic with the highest concentration of records near the township of Glenfield to the east.

It is considered that this study area does not comprise Core Koala Habitat. However, the vegetation present does contain *Eucalyptus tereticornis* which is listed as a Koala primary feed tree. It is recommended that that *Eucalyptus tereticornis* trees should be retained to conserve the diversity of Koala habitat.

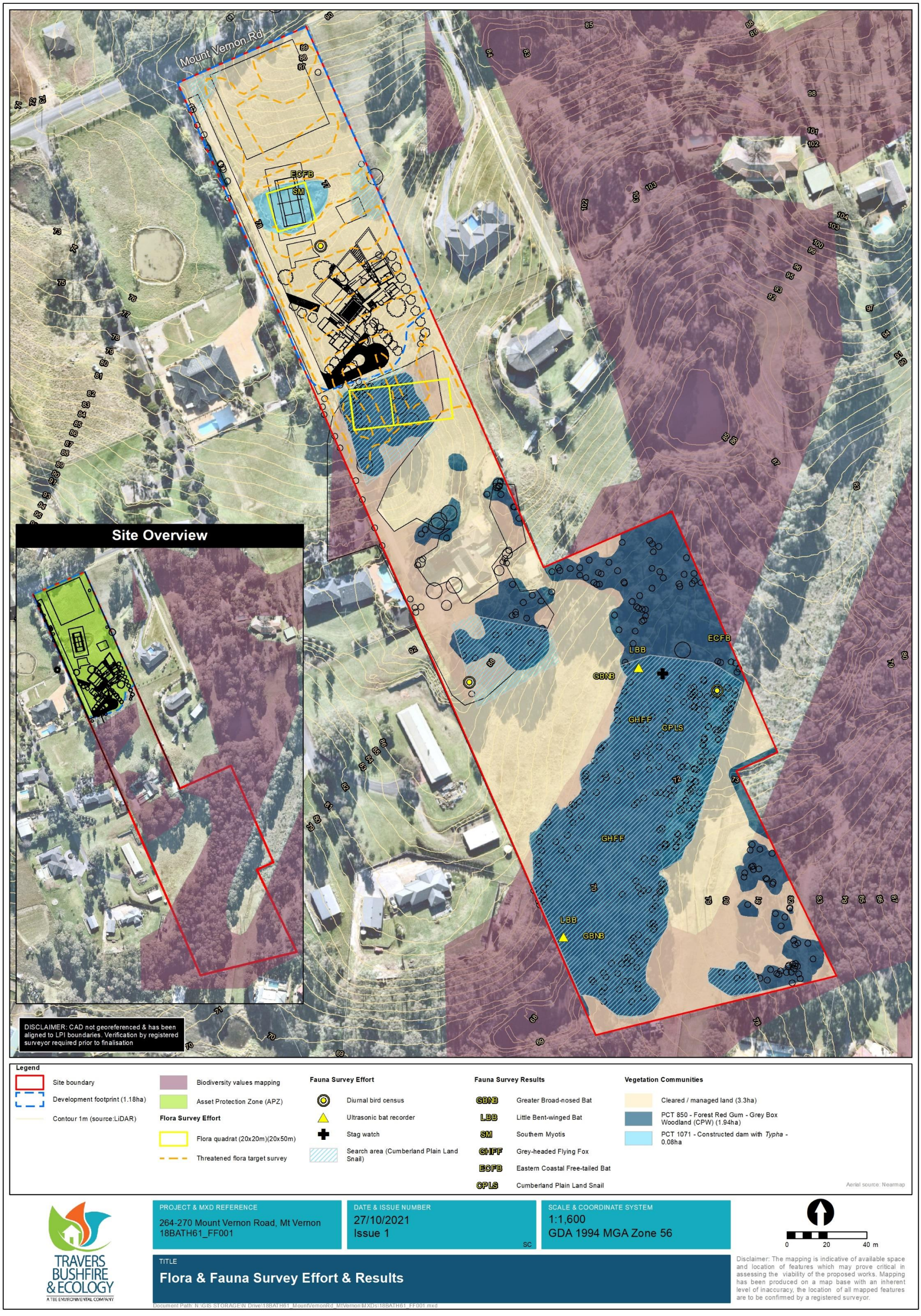


Figure 6 - Flora & fauna survey effort & results

3.7 Connectivity

The existing vegetated landscape consists of Cumberland Plain Woodland set amidst a managed grassland environment. There are several very small remnants scattered within the lot, with the main riparian zone containing a relatively intact canopy layer. The shrub layer is almost completely absent or less than 5% coverage, therefore it does not provide good shelter or foraging opportunities for terrestrial fauna. Vegetation within the riparian corridor outside of the development footprint has moderate connectivity links generally in a north-south direction, although somewhat hindered by rural fencing and Elizabeth Drive to the south.

There are not many large Eucalypt trees within the main riparian corridor, or within the remnant patch just south of the development footprint. Historic photos from 1970 show a scattering of trees with very juvenile regrowth along the riparian zone, and no vegetation within areas currently mapped as biodiversity values land by DPIE. Therefore historically, the vegetation across the lot is young and that would explain why a lot of the trees appear to be of similar age.

Native vegetation within the lot will not compromise any connectivity value, nor cause fragmentation or isolation of habitats.

Figure 7 below shows the local connective habitat.

Figure 7 – Local connectivity

4. WATERCOURSES & WETLANDS

4.1 Endangered wetland communities

A number of wetland communities have been listed as an 'endangered ecological community' under the NSW *BC Act*.

Impacts on wetland communities must be assessed under the *BC Act* and if present the management of wetland communities must be given due consideration in accordance with the objectives and principles of management as contained within the NSW Wetlands Policy (2010), and appropriate management as determined by NSW DPIE - Office of Water in their general terms of approval. This may include but not limited to the provision of buffers, management of stormwater runoff and maintenance of natural inflows or runoff into those wetland communities.

- Artesian springs ecological community
- Castlereagh Swamp Woodland Community
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions
- Coastal Upland Swamp in the Sydney Basin bioregion
- Coolibah–Black Box woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands bioregions
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Kurri sand swamp woodland in the Sydney Basin Bioregion
- Lagunaria swamp forest on Lord Howe Island
- Maroota Sands swamp forest
- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion
- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- The shorebird community occurring on the relict tidal delta sands at Taren Point
- Upland wetlands of the drainage divide of the New England Tableland Bioregion
- Wingecarribee Swamp

No endangered wetland communities were present within the study area, therefore a referral to NRAR is not required for impacts on waterfront land.

4.2 Groundwater dependent ecosystems (GDEs)

Groundwater dependent ecosystems are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- wetlands;
- red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation;
- ecosystems in streams fed by groundwater;
- limestone cave systems;
- springs; and
- hanging valleys and swamps.

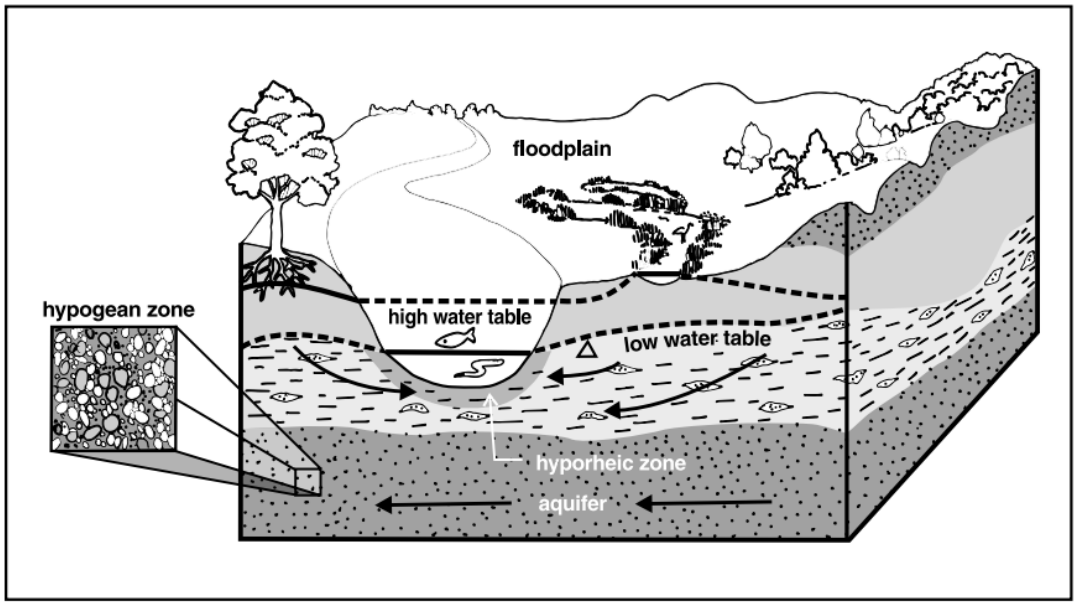


Figure 8 – Alluvial groundwater system discharging into a river

Groundwater dependent ecosystems are therefore ecosystems which have their species composition and their natural ecological processes determined by groundwater (NSW State Groundwater Dependent Ecosystems Policy April 2002).

Groundwater Dependent Ecosystems (GDEs) were not observed within the study area and therefore the policy does not require any further consideration. A referral to NRAR is not required for impacts on waterfront land.

4.3 Watercourse assessment

The proposed development will not impact on watercourses or drainage lines, or within 40 m of waterfront land. A referral to NRAR is not required for impacts on waterfront land.

4.4 Coastal Management SEPP

The NSW DPE *Coastal Wetlands and Littoral Rainforests Area Map*

(http://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement) identifies an area within the wetland as “coastal wetlands”, and a buffer area surrounding the margin of the wetland as “proximity area for coastal wetlands” (Figure 9).

As stated in the *State Environmental Planning Policy (Coastal Management) 2018*, development consent is required for any development within these areas and must not be given unless the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland. Additionally, within the “proximity area for coastal wetlands” area, development consent must not be given unless the consent authority is satisfied that the proposed development will not significantly impact on the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland.

The closest mapped wetland to the site is located 3.4 km to the east of the site. As such, the proposal will have no impact on the Coastal Management SEPP.

Figure 9 – Coastal wetlands area map

(solid blue - coastal wetlands; hatched blue - proximity area for coastal wetlands).

5. BIODIVERSITY IMPACT ASSESSMENT

5.1 Biodiversity Offsets Scheme (BOS)

The *BC Act* repeals the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and the animal and plant provisions of the *National Parks and Wildlife Act 1974*. Together with the *Biodiversity Conservation Regulation 2017*, the *BC Act* establishes a new regulatory framework for assessing and offsetting biodiversity impacts on proposed developments and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method (BAM).

Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method (BAM).

The Biodiversity Offsets Scheme applies to:

- local development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that triggers the Biodiversity Offsets Scheme Threshold or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the *Biodiversity Conservation Act 2016*
- state significant development and state significant infrastructure projects, unless the Secretary of the Department of Planning, Industry and Environment and the environment agency head determine that the project is not likely to have a significant impact
- biodiversity certification proposals
- clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the Biodiversity Offsets Scheme threshold and does not require development consent
- clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013*
- activities assessed and determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (generally, proposals by government entities) if proponents choose to 'opt in' to the Scheme.

Proponents will need to supply evidence relating to the triggers for the Biodiversity Offsets Scheme Threshold and the test of significance (where relevant) when submitting their application to the consent authority.

5.2 Threshold assessment

The BOS includes two (2) elements to the threshold test – an area trigger and a Biodiversity Values Land Map trigger. If clearing exceeds either trigger, the BOS applies to the proposed clearing.

5.2.1 Biodiversity Values Land Map

Biodiversity Values Land has been mapped within the lot. The proposal has been altered to avoid impacts from the proposed asset protection zone off the southern side of the building, therefore an offset is not required under this trigger. Figure 10 below shows the site (blue) in relation to those areas (coloured mauve) as having biodiversity values.

Figure 10 – Biodiversity values land (mauve shading) in the local area

(Source: DPIE – Biodiversity Values Map – March 2019)

5.2.2 Area clearing threshold

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

Table 5 – BOS Entry Threshold Report

Results Summary

Date of Calculation	03/08/2021 3:37 PM	**BDAR Required***
Total Digitised Area	4.74 ha	
Minimum Lot Size Method	LEP	
Minimum Lot Size	1 ha	
Area Clearing Threshold	0.5 ha	
Area clearing trigger Area of native vegetation cleared	Unknown #	Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	yes	yes
Date of the 90 day Expiry	N/A	

Table 5 identifies that the BOS entry threshold report has determined the area threshold based on the minimum lot size of 1 ha, and the area clearing threshold for which the BOS applies is 1ha. Clearing of 'native vegetation' that exceeds 0.5 ha will require a biodiversity offset to be obtained. Note that 'native vegetation' includes planted native species. The development proposal will not impact more than 0.5 ha of native vegetation, therefore offsetting will not be required under this trigger.

5.3 Serious and irreversible impacts on biodiversity values

Development consent cannot be granted for non-State significant development under Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW) if the consent authority is of the opinion it is likely to have serious and irreversible impacts (SAII) on biodiversity values. The determination of SAII is to be made in accordance with principles prescribed section 6.7 of the *BC Regulation* (2017).

Candidate SAII species with considered potential to occur are listed in Table 6

Table 6 – Candidate SAII species / communities with potential habitat

Common name	*BC Act*	*EPBC Act*	Potential to occur
Little Bent-winged Bat	V	-	Recorded
Cumberland Plain Woodland	CE	CE	Recorded

The additional impact assessment provisions for threatened species are outlined under Section 10.2.3 of the BAM (2017) and have been applied to the recorded Grey Headed Flying Fox, Southern Myotis, Greater Broad-nosed Bat and Little Bent-winged Bat within Appendix 5. As a result of this assessment, it is considered that the proposal will not likely cause a serious or irreversible impact on this microbat species or other candidate fauna species considered.

The proposal has been designed to avoid impacts of Cumberland Plain Woodland. None of this community occurs within the development footprint. Further assessment of the SAII entity is not required.

The recording of Little Bent-winged Bat is considered to have been opportunistic. Foraging material may be available locally, however the habitat constraint for breeding is caves. There are no caves or cave-like structures known in the locality, therefore as breeding habitat is absent or not impacted, no further SAII consideration is required.

5.4 Potential ecological impacts

The direct, indirect and cumulative ecological impacts have been considered in respect to recorded biodiversity, threatening processes and extent of impact as a result of the proposed works.

5.4.1 BC Reg Prescribed impacts

The proposal is not expected to cause any prescribed impacts (subject to subclause (2) of the *BC Reg*).

The following potential impacts on biodiversity values as a result of the proposal are prescribed (subject to subclause (2) of the BC Reg) as biodiversity impacts to be assessed under the biodiversity offsets scheme:

- Karst, caves, crevices, cliffs and other geological features of significance,
    - all absent from the development footprint
- Rocks,
    - absent from the development footprint
- Human made structures,
    - the dam is a human made structure. It will be removed as part of the proposal. A dam dewatering plan is recommended to ensure that if in use by fauna, the fauna can be safely relocated.
- Non-native vegetation,
    - non-native vegetation exists along the western boundary that will not require removal for the development proposal
    - the grassland to be impacted contains >90% exotic species and is regularly maintained. The proposal will impact on some parts of the grassland area for construction. The impact will have little bearing on local fauna.
- Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,
    - native vegetation being removed is largely the opportunistic *Typha orientalis* and a few fringing macrophytes and *Themeda triandra* within and adjacent to the dam. This is not part of a connected landscape therefore the proposal will not impact connectivity values.
- Movement of threatened species that maintains their lifecycle,
    - the removal of the dam may impact foraging by Southern Myotis. The surface area of the dam is small and there are many dams of similar size and quality or better in the locality. Impacts upon Southern Myotis would be negligible.
- Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development),
    - the removal of the dam may impact foraging by Southern Myotis. The surface area of the dam is small and there are many dams of similar size and quality or better in the locality. Impacts upon Southern Myotis would be negligible.
- Wind turbine strikes on protected animals,
    - not applicable
- Vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community
    - not applicable

5.4.2 Direct impacts

The direct impacts of the proposal within the development footprint are considered as:

- Removal of the dam and associated macrophyte vegetation,
- Loss of potential foraging habitat for Southern Myotis,
- Loss of a small area of pasture habitat that is regularly mown.

5.4.3 Indirect impacts

The potential indirect impacts of the proposal are considered as:

- Trampling of regrowth within patches of Cumberland Plain Woodland,
- Increased soil nutrients from changes to runoff that may provide further opportunities for weed plumes,
- Minor hydrological changes due to removal of the dam.

5.4.4 Cumulative impacts

The potential cumulative impacts (combined results of past, current and future activities) of the proposal are considered as:

- Increased risk of weed invasion and fungal mobilisation or infections
- Cumulative loss of foraging habitat for native fauna
- Increased varied human presence and activity within the remaining natural habitat areas of the adjacent bushland remnant.
- Edge effects from inappropriate use of remaining native vegetation areas such as additional clearing, dumping of materials, dumping of fecal, food or general waste and building refuse.

5.5 Avoid actions

The asset protection zone has been revised to avoid impacts on biodiversity values land and subsequent offsetting through the Biodiversity Offset Scheme.

Reducing the APZ means avoiding impacts on Cumberland Plain Woodland.

The proposal will not impact any hollow-bearing trees.

5.6 Mitigation measures

The following mitigation measures are recommended to avoid, minimise or ameliorate the above potential ecological impacts, address threatening processes and to guide a more positive ecological outcome for threatened species and their associated habitats.

a) The adjoining Cumberland Plain Woodland remnant just south of the development footprint is to be fully fenced off allowed to regenerate naturally. It will not be managed as an APZ nor be allowed to have routine understorey maintenance undertaken except for the removal of weeds (in particularly woody weeds such as Ligustrum and African Olive).

b) Standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres. Any equipment onsite found to contain soil or vegetation material is to be cleaned in a quarantined work area or wash station and treated with anti-fungal herbicides.

c) The preparation of a dam dewatering plan is recommended, with a fauna ecologist to be present during the dewatering process to relocate any animal if found.

6. CONCLUSION

Ecological survey assessment has been undertaken in accordance with relevant legislation including the *Environmental Planning and Assessment Act 1979*, the *Biodiversity Conservation Act 2016*, the commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the *Fisheries Management Act 1994*.

In respect of matters required to be considered under the *Environmental Planning and Assessment Act 1979* and relating to the species / provisions of the *Biodiversity Conservation Act 2016*, six (6) threatened fauna species including Grey Headed Flying Fox, Little Bent-winged Bat, Eastern Coastal Free-tailed Bat, Southern Myotis, Greater Broad-nosed Bat and Cumberland Plain Land Snail have been recorded. No threatened flora species and no endangered populations were recorded. Cumberland Plain Woodland was recorded within the lot however the proposal will avoid impacts upon this entity as the locations were within the riparian zone, more than 200 m from the development footprint.

The state assessment of significance (Appendix 3) has concluded that the proposed development will not have a significant impact on any threatened species, populations or TECs. Therefore, (a) a Species Impact Statement is not required for the proposal and (b) biodiversity offsetting is not required.

Offsetting under the Biodiversity Offsets Scheme (BOS) is not required for the proposal as:

- The study area is not located on lands mapped as Biodiversity Values Land.
- The proposal will impact 0.08 ha of PCT 1071, it will not impact PCT 850. As the clearing threshold is 0.5 ha, the proposed impact to native vegetation is less than the area clearing threshold.
- The test of significance concludes a not-significant impact on the relative entities being tested.

The proposal will also not cause any Serious or Irreversible Impacts (SAII) on threatened biodiversity most at risk of extinction as it will not have a direct impact on breeding habitat for Little Bent-winged Bat, nor impact Cumberland Plain Woodland.

In respect of matters required to be considered under the *Environment Protection and Biodiversity Conservation Act 1999*, one (1) threatened fauna species the Grey-headed Flying-fox, no protected migratory bird species, no threatened flora species, and one (1) TECs Cumberland Plain Woodland were recorded within the study area.

The proposal was not considered to have a significant impact on matters of national environmental significance. As such a referral to Department of Agriculture, Water and the Environment is not required.

In respect of matters relative to the *Fisheries Management Act 1994*, no suitable habitat for threatened marine or aquatic species was observed within the development footprint and there are no matters requiring further consideration under this Act.

APPENDICIES 1. FLORA & FAUNA SPECIES LISTS

Table 7 – Flora species recorded (Appendix 1)

Family	Scientific name	Common name
TREES		
Myrtaceae	*Angophora floribunda*	Rough-barked Apple
Cupressaceae	*Cupressocyparis leylandii**	Leyland Cypress
Fabaceae	*Erythrina sykesii**	Coral Tree
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Bignoniaceae	*Jacaranda mimosifolia**	Jacaranda
Meliaceae	*Melia azedarach* var. *australasica*	White Cedar
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Rosaceae	*Prunus comomunis**	Ornamental Pear
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
SHRUBS		
Mimosaceae	*Acacia implexa*	Hickory
Asparagaceae	*Asparagus officinalis**	Asparagus
Solanaceae	*Cestrum parqui**	Chilean Cestrum
Apocnynaceae	*Gomphocarpus fruticosus**	Narrow Leaf Cotton Bush
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Lantana montevidensis**	Trailing Lantana
Oleaceae	*Ligustrum lucidum**	Large-leaved Privet
Araceae	*Monstera deliciosa**	Fruit-salad Plant
Oleaceae	*Olea europaea* subsp. *cuspidata**	African Olive
Asteraceae	*Osteospermum fruticosum**	Shrubby Daisy-bush
Malvaceae	*Pavonia hastata**	-
Rosaceae	*Pycantha angustifolia**	Firethorn
Asteraceae	*Senecio pterophorus**	-
Solanaceae	*Solanum sisymbriifolium**	-
GROUNDCOVERS		
Liliaceae	*Agapanthus praecox**	Agapanthus
Poaceae	*Aira cupaniana**	Silvery Hairgrass
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel
Rubiaceae	*Asperula conferta*	Common Woodruff
Poaceae	*Avena fatua**	Wild Oats
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Brassicaceae	*Brassica fruticulosa**	Twiggy Turnip
Poaceae	*Briza minor**	Shivery Grass
Cannaceae	*Canna indica**	Indian Shot
Poaceae	*Cenchrus clandestinus**	Kikuyu
Poaceae	*Chloris ventricosa*	Tall Chloris
Asteraceae	*Cirsium vulgare**	Spear Thistle
Asteraceae	*Conyza bonariensis**	Flaxleaf Fleabane
Asteraceae	*Conyza sumatrensis**	Fleabane

Family	Scientific name	Common name
Apiaceae	*Cyclospermum leptophyllum**	Slender Celery
Poaceae	*Cynodon dactylon*	Common Couch
Cyperaceae	*Cyperus brevifolius**	Mullumbimby Couch
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge
Convolvulaceae	*Dichondra repens*	Kidney Weed
Poaceae	*Ehrharta erecta**	Panic Veldtgrass
Chenopodiaceae	*Einadia hastata*	Berry Saltbush
Chenopodiaceae	*Einadia nutans* subsp. *linifolia*	Climbing Saltbush
Papaveraceae	*Fumaria muralis*	Wall Fumitory
Asteraceae	*Gamochaeta spicata**	Cudweed
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Clusiaceae	*Hypericum gramineum*	Small St Johns Wort
Clusiaceae	*Hypericum perforatum**	St Johns Wort
Asteraceae	*Hypochaeris radicata**	Flatweed
Lobeliaceae	*Lobelia purpurascens*	Whiteroot
Poaceae	*Lolium perenne**	Perennial Ryegrass
Fabaceae	*Lotus subbiflorus**	Hairy Birds-foot Trefoil
Malvaceae	*Malva sylvestris**	Tall Mallow
Fabaceae	*Medicago polymorpha**	Burr Medic
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Grass
Malvaceae	*Modiola caroliniana**	Red-flowered Mallow
Onagraceae	*Oenothera stricta**	-
Cactaceae	*Opuntia stricta**	Prickly Pear
Oxalidaceae	*Oxalis corniculata**	Yellow Wood Sorrel
Oxalidaceae	*Oxalis latifolia**	Pink Fishtail
Oxalidaceae	*Oxalis perennans*	-
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Paspalum urvillei**	Vasey Grass
Geraniaceae	*Pelargonium* sp.*	-
Plantaginaceae	*Plantago lanceolata**	Ribwort
Polygonaceae	*Rumex crispus**	Curled Dock
Asteraceae	*Senecio madagascariensis**	Fireweed
Poaceae	*Setaria parviflora**	-
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Solanaceae	*Solanum prinophyllum*	Forest Nightshade
Solanaceae	*Solanum pseudocapsicum**	-
Asteraceae	*Soliva sessilis**	Jojo
Asteraceae	*Sonchus oleraceus**	Common Sow-thistle
Poaceae	*Sporobolus africanus**	Parramatta Grass
Asteraceae	*Taraxacum officinale**	Dandelion
Poaceae	*Themeda triandra*	Kangaroo Grass
Commelinaceae	*Tradescantia fluminensis**	Wandering Jew
Fabaceae	*Trifolium repens**	White Clover
Typhaceae	*Typha orientalis*	Cumbungi
Verbenaceae	*Verbena bonariensis**	Purpletop
VINES		

Family	Scientific name	Common name
Basellaceae	*Anredera cordifolia**	Madeira Vine
Apocnyaceae	*Araujia sericifera**	Mothvine
Fabaceae	*Glycine clandestina*	Twining Glycine
Fabaceae	*Hardenbergia violacea*	False Sarsparilla
Araliaceae	*Hedera helix**	English Ivy
Passifloraceae	*Passiflora suberosa**	Cork Passionfruit
Polygonaceae	*Rumex sagittatus**	Turkey Rhubarb
Acanthaceae	*Thunbergia alata**	Black-eyed Susan
Fabaceae	*Vicia sativa subsp. sativa**	Common Vetch
* denotes exotic species		

It should be noted that not all garden, cultivar or landscape species have been identified as part of this assessment.

Table 8 – Fauna species recorded (Appendix 1)

Common name	Scientific name	Method observed
Birds		Oct 2021
Australian Wood Duck	*Chenonetta jubata*	OW
Bell Miner	*Manorina melanophrys*	W
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	O
Cattle Egret	*Ardea ibis*	O
Common Myna *	*Sturnus tristis*	OW
Domestic Chicken *	*Gallus gallus domesticus*	W
Eastern Rosella	*Platycercus eximius*	OW
Galah	*Eolophus roseicapillus*	OW
Green Catbird	*Ailuroedus crassirostris*	OW
Grey Butcherbird	*Cracticus torquatus*	OW
Magpie-lark	*Grallina cyanoleuca*	OW
Noisy Friarbird	*Philemon corniculatus*	OW
Noisy Miner	*Manorina melanocephala*	OW
Pied Butcherbird	*Cracticus nigrogularis*	OW
Rainbow Lorikeet	*Trichoglossus haematodus*	OW
Red Wattlebird	*Anthochaera carunculata*	OW
Red-rumped Parrot	*Psephotus haematonotus*	OW
Sulphur Crested Cockatoo	*Cacatua galerita*	OW
Welcome Swallow	*Hirundo neoxena*	OW
Willy Wagtail	*Rhipidura leucophrys*	OW
Mammals		
Black Rat *	*Rattus rattus*	K
Brown Hare *	*Lepus capensis*	O
Chocolate Wattled Bat	*Chalinolobus morio*	AR

Common name	Scientific name	Method observed
Common Brushtail Possum	*Trichosurus vulpecula*	O
Domesticated Dog *	*Canis lupus familiaris*	O
Domesticated Goat *	*Capra hircus*	O
Domesticated Sheep *	*Ovis aries*	OK
Eastern Coastal Free-tailed Bat TS	*Mormopterus norfolkensis*	AR
Eastern Grey Kangaroo	*Macropus giganteus*	O
Fallow Deer *	*Darma darma*	O
Gould's Wattle Bat	*Chalinolobus gouldii*	AR
Greater Broad-nosed Bat TS	*Scoteanax rueppellii*	AR
Grey-headed Flying-fox TS	*Pteropus poliocephalus*	O
Horse *	*Equus caballus*	O
Little Bent-winged Bat TS	*Miniopterus australis*	AR
Rabbit *	*Oryctolagus cuniculus*	O
Southern Myotis TS	*Myotis macropus*	AR
White-striped Free-tailed bat	*Tadarida australis*	AR
Reptiles		
Delicate Skink	*Lampropholis delicata*	O
Eastern Striped Skink	*Ctenotus robustus*	O
Amphibians		
Common Eastern Froglet	*Crinia signifera*	W
Dwarf Tree Frog	*Litoria fallax*	W
Peron's Tree Frog	*Litoria peronii*	OW
Fish		
Common Carp *	*Cyprinus carpio*	O
Molluscs		
Cumberland Plain Land Snail TS	*Meridolum corneovirens*	O

Note: * indicates introduced species
TS indicates threatened species
MS indicates Migratory species

All species listed are identified to a high level of certainty unless otherwise noted as:

PR indicates species identified to a 'probable' level of certainty – more likely than not
PO indicates species identified to a 'possible' level of certainty – low-moderate level of confidence

AR - Acoustic Recording	H - Hair/feathers/skin	P - Scat	W - Heard call
E - Nest/roost	K- Dead	Q- Camera	X- In scat
F- Tracks/scratchings	O - Observed	T - Trapped/netted	Y - Bone/teeth/shell
FB - Burrow	OW- Obs & heard call	U- Anabat/ultrasound	Z- In raptor/owl pellet
G - Crushed cones			

APPENDICIES 2. THREATENED FLORA & FAUNA HABITAT ASSESSMENT

Table 9 – Threatened flora species habitat assessment (Appendix 2)

Scientific name DATABASE SOURCE	*BC Act*	*EPBC Act*	Growth form and habitat requirements Distribution limit	Recorded on site (y/n)	If not recorded on site				Considered in assessment of significance test (y/n) Refer to Appendix 3
					Suitable habitat present (y/n)	Nearby and / or high number of record(s) (y/n) Notes 1,2 & 3	Record(s) from recent years (y/n) Notes 1,2 & 3	Potential to occur	
Acacia bynoeana EPBC	E1	V	Erect or spreading shrub to 0.3m high growing in heath and dry sclerophyll open forest on sandy soils. Often associated with disturbed areas such as roadsides. Distribution limits N-Newcastle S-Berrima.	n	n	-	-	n	n
Acacia pubescens DPIE EPBC	V	V	Spreading shrub 1-4m high open sclerophyll growing in open forest and woodlands on clay soils. Distribution limits N-Bilpin S-Georges River.	n	low	y, 317 within 10km	y	unlikely	n
Allocasuarina glareicola DPIE EPBC	E1	E	Small shrub 1-2m high growing in open sclerophyll forest on lateritic soils derived from tertiary alluviums. Distribution limits Castlereagh NR region.	n	n	-	-	n	n
Cryptostylis hunteriana EPBC	V	V	Saprophytic orchid. Grows in swamp heath on sandy soils. Distribution limits N-Gibraltar Range S-south of Eden.	n	n	-	-	n	n
Cynanchum elegans DPIE EPBC	E1	E	Climber or twiner to 1m. Grows in rainforest gullies, scrub & scree slopes. Distribution limits N-Gloucester S-Wollongong.	n	n	-	-	n	n
Dillwynia tenuifolia DPIE	V	-	Erect shrub 0.6-1m high. Grows in woodlands and open forest on sandstone shale or laterite. Distribution limits N-Howes Valley S-Cumberland Plain.	n	low	y, 714 within 10mn	y	unlikely	n
Eucalyptus scoparia DPIE	E1	V	Smooth-barked tree only known naturally from vicinity of Bald Rock in Northern NSW. Commonly planted as a street tree in the Sydney region.	n	n	-	-	n	n
Genoplesium baueri EPBC	E1	E	A terrestrial orchid that grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers Feb–Mar. Distribution limits N – Hunter Valley S – Nowra.	n	n	-	-	n	n

Scientific name DATABASE SOURCE	*BC Act*	*EPBC Act*	Growth form and habitat requirements Distribution limit	Recorded on site (y/n)	If not recorded on site				Considered in assessment of significance test (y/n) Refer to Appendix 3
					Suitable habitat present (y/n)	Nearby and / or high number of record(s) (y/n) Notes 1,2 & 3	Record(s) from recent years (y/n) Notes 1,2 & 3	Potential to occur	
Grevillea juniperina subsp. juniperina DPIE	V	-	Erect to spreading shrub 0.5-1.5m tall. Grows on soils derived from Wianamatta Shale, laterite and Tertiary alluvium. Distribution limits St Marys-Londonderry-Prospect.	n	x	-	-	x	x
Grevillea parviflora subsp. parviflora DPIE EPBC	V	V	Open to erect shrub to 1m. Grows in woodland on light clayey soils. Distribution limits N-Cessnock S-Appin.	n	low	y, limited number, nearest 2km away	y	unlikely	n
Haloragis exalata subsp. exalata EPBC	V	V	Shrub to 1.5m high. Grows in damp places near watercourses. Distribution limits N-Tweed Heads S-south of Eden.	n	n	-	-	n	n
Melaleuca deanei EPBC	V	V	Shrub to 3m high. Grows in heath on sandstone. Distribution limits N-Gosford S-Nowra.	n	n	-	-	n	n
Persicaria elatior EPBC	V	V	Herb to 90cm tall which grows in damp places especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. Varied distribution from SE NSW to QLD.	n	n	-	-	n	n
Persoonia hirsuta EPBC	E1	E	Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. Distribution limits N-Glen Davis S-Hill Top.	n	n	-	-	n	n
Persoonia nutans DPIE EPBC	E1	E	Erect to spreading shrub. Grows in dry sclerophyll forest and woodland on laterite and alluvial sands. Distribution limits Cumberland Plain.	n	n	-	-	n	n
Pilularia novae-hollandiae DPIE	E1	-	Widespread but not common in seasonally dry depressions and margins of marshes; may grow submerged.	n	n	-	-	n	n

Scientific name DATABASE SOURCE	*BC Act*	*EPBC Act*	Growth form and habitat requirements Distribution limit	Recorded on site (y/n)	If not recorded on site				Considered in assessment of significance test (y/n) Refer to Appendix 3
					Suitable habitat present (y/n)	Nearby and / or high number of record(s) (y/n) Notes 1,2 & 3	Record(s) from recent years (y/n) Notes 1,2 & 3	Potential to occur	
Pimelea curviflora var. curviflora DPIE	V	V	Woody herb or sub-shrub to 0.2-1.2m high. Grows on Hawkesbury Sandstone near shale outcrops. Distribution Sydney.	n	n	-	-	n	n
Pimelea spicata DPIE EPBC	E1	E	Decumbent or erect shrub to 0.5m high. Occurs principally in woodland on soils derived from Wianamatta Shales. Distribution limits N-Lansdowne S-Shellharbour.	n	y	y, nearest is 1.5km away	y	y	y
Pomaderris brunnea EPBC	V	V	Shrub to 3m high. Confined to Upper Nepean and Colo Rivers where it grows in open forest.	n	n	-	-	n	n
Pterostylis gibbosa EPBC	E1	E	Terrestrial orchid which occurs near Wollongong and in Hunter Valley in sclerophyll forest, sometimes with paperbarks.	n	n	-	-	n	n
Pterostylis nigricans DPIE	V	-	Terrestrial orchid. Prefers coastal heathland with Heath Banksia (Banksia ericifolia), and lower-growing heath with lichen-encrusted and relatively undisturbed soil surfaces, on sandy soils. The Dark Greenhood occurs in north-east NSW north from Evans Head, and in Queensland.	n	n	-	-	n	n
Pterostylis saxicola EPBC	E1	E	Terrestrial orchid. Grows in shallow sandy soil above rock shelves, usually near Wianamatta / Hawkesbury transition. Distribution limits N-Hawkesbury River S-Campbelltown.	n	n	-	-	n	n
Pultenaea parviflora DPIE	E1	V	Erect shrub. Grows in dry sclerophyll forest at the intergrade between Tertiary Alluviums and Wianamatta Shales. Distribution limits Cumberland Plain.	n	low	y	y	unlikely	n

Scientific name DATABASE SOURCE	*BC Act*	*EPBC Act*	Growth form and habitat requirements Distribution limit	Recorded on site (y/n)	If not recorded on site				Considered in assessment of significance test (y/n) Refer to Appendix 3
					Suitable habitat present (y/n)	Nearby and / or high number of record(s) (y/n) Notes 1,2 & 3	Record(s) from recent years (y/n) Notes 1,2 & 3	Potential to occur	
Pultenaea pedunculata DPIE	E1	-	Prostrate shrub. Grows in dry sclerophyll forest and disturbed sites. Confined to Prestons and Villawood in NSW.	n	n	-	-	n	n
Rhizanthella slateri EPBC	V	E	Underground orchid that is poorly known. Grows in sclerophyll forests. Usually only seen if the soil is disturbed. Flowers in Oct – Nov.	n	n	-	-	n	n
Rhodamnia rubescens EPBC	E4A	-	Shrub or small tree to 25 m high found in rainforest and riparian vegetation along the coast and up to 600m ASL. Flowers in late winter through to spring, with a peak in October, and fruits typically begin to appear in December in the Sydney region. Distribution limits N-Tweed Heads S-Batemans Bay.	n	n	-	-	n	n
Syzygium paniculatum EPBC	V	V	Small tree. Subtropical and littoral rainforest on sandy soil. Distribution limits N-Forster S-Jervis Bay.	n	n	-	-	n	n
Thesium australe EPBC	V	V	Erect herb to 0.4m high. Root parasite. Themeda grassland or woodland often damp. Distribution limits N-Tweed Heads S-south of Eden.	n	n	-	-	n	n

DPIE	- Denotes species listed within 10km of the development footprint on the Atlas of NSW Wildlife
EPBC	- Denotes species listed within 10km of the development footprint in the *EPBC Act* habitat search
V	- Denotes vulnerable listed species under the relevant Act
E or E1	- Denotes endangered listed species under the relevant Act
E4a or CE	- Denotes critically endangered listed species under the relevant Act
NOTE:	This field is not considered if no suitable habitat is present within the development footprint 'records' refer to those provided by the Atlas of NSW Wildlife 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle

Table 10 – Threatened fauna species habitat assessment (Appendix 2)

Common name *Scientific name* Database source	*BC Act*	*EPBC Act*	Preferred habitat *Distribution limit*	Recorded on site (y/n)	If not recorded on site				Considered in test of significance (✓) Refer to Appendix 3
					Suitable habitat present (y/n)	Nearby and/or high number of record(s) (y/n) *Notes 1,2 & 3*	Record(s) from recent years (y/n) *Notes 1,2 & 3*	Potential to occur	
Green and Golden Bell Frog *Litoria aurea* DPIE EPBC	E	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. *Distribution limit: N-Byron Bay S-South of Eden.*	n	marginal	n	n	not likely	x
Giant Burrowing Frog *Heleioporus australiacus* DPIE EPBC	V	V	Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. *Distribution limit: N-Near Singleton S-South of Eden.*	n	sub optimal	n	n	not likely	x
Southern Bell Frog *Litoria raniformis* DPIE EPBC	E	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. *Distribution limit: N-ACT Bay. S-Albury.*	n	sub optimal	n	n	not likely	x
Freckled Duck *Stictonetta naevosa* DPIE	V	-	Occurs mainly within the Murray-Darling basin and the channel country within large cool temperate to sub-tropical swamps, lakes and floodwaters with cumbungi, lignum or melaleucas. *Distribution limit: N- Tenterfield. S-Albury.*	n	sub optimal	y	y	not likely	x
Australasian Bittern *Botaurus poiciloptilus* EPBC	E	E	Found in or over water of shallow freshwater or brackish wetlands with tall reedbeds, sedges, rushes, cumbungi, lignum and also in ricefields, drains in tussocky paddocks, occasionally saltmarsh, brackish wetlands. *Distribution limit: N-North of Lismore. S-Eden.*	n	sub optimal	n	n	not likely	x
Spotted Harrier *Circus assimilis* DPIE	V	-	Utilises grassy plains, crops and stubblefields; saltbush, spinifex associations; scrublands, mallee, heathlands; open grassy woodlands. *Distribution limit: N-Tweed Heads. S-South of Eden.*	n	marginal	y	n	not likely	x

White-bellied Sea Eagle (*Haliaeetus leucogaster*) DPIE	V	-	Occupies coasts, islands, estuaries, inlets, large rivers, inland lakes and reservoirs. *Sedentary; dispersive. N-Tweed Heads. S-South of Eden.*	n	sub optimal	n	n	not likely	x
Little Eagle *Hieraaetus morphnoides* DPIE	V	-	Utilises plains, foothills, open forests, woodlands and scrublands; river red gums on watercourses and lakes. *Distribution limit - N-Tweed Heads. S-South of Eden.*	n	optimal	y	y	yes	✓
Square-tailed Kite *Lophoictinia isura* DPIE	V	-	Utilises mostly coastal and sub-coastal open forest, woodland or lightly timbered habitats and inland habitats along watercourses and mallee that are rich in passerine birds. *Distribution limit: N-Goondiwindi. S-South of Eden.*	n	sub optimal	n	n	low	x
Grey Falcon *Falco hypoleucos* DPIE	V	-	Occurs over mainly inland drainage systems of open plains and lightly timbered country including the acacia scrub, spinifex and tussock grasslands. *Distribution limit: N-Mullumbimby. S-Bega.*	n	sub optimal	n	n	not likely	x
Australian Painted Snipe *Rostratula australis* EPBC	E	E	Most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. *Distribution limit: N-Tweed Heads. S-South of Eden.*	n	sub optimal	n	n	not likely	x
Curlew Sandpiper *Callidris ferruginea* DPIE	E	CE	Mainly coastal, but many inland feeding along tidal mudflats, salt marsh, salt fields, fresh, brackish or saline wetlands and sewerage ponds. *Distribution limit: N-Tweed Heads. S-South of Eden.*	n	sub optimal	n	no	not likely	x
Eastern Curlew *Numenius madagascariensis* TBE	-	CE	Primarily coastal especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. Often recorded among saltmarsh and on mudflats fringed by mangroves and also in coastal saltworks and sewage farms. *Distribution limit: N-Tweed Heads. S-South of Eden.*	n	sub optimal	n	n	not likely	x
Gang-gang Cockatoo *Callocephalon fimbriatum*	V	-	Prefers wetter forests and woodlands from sea level to > 2,000m on the Great Dividing Range, timbered foothills and valleys, timbered watercourses, coastal scrubs, farmlands and suburban gardens. *Distribution limit: mid north coast of NSW to western Victoria.*	n	marginal	n	no	not likely	x

DPIE									
Little Lorikeet *Glossopsitta pusilla* DPIE	V	-	Inhabits forests, woodlands; large trees in open country; timbered watercourses, shelterbeds, and street trees. *Distribution limit: N-Tweed Heads. S-South of Eden*.	n	optimal	n	no	low	x
Swift Parrot *Lathamus discolour* DPIE EPBC	E	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. *Distribution limit: N-Border Ranges National Park. S-South of Eden*.	n	optimal	n	no	yes	x
Turquoise Parrot *Neophema pulchella* DPIE	V	-	Inhabits coastal scrubland, open forest and timbered grassland, especially ecotones between dry hardwood forests and grasslands. *Distribution limit: N-Near Tenterfield. S-South of Eden.*	n	optimal	n	no	unlikely	x
Barking Owl *Ninox connivens* DPIE	V	-	Inhabits principally woodlands but also open forests and partially cleared land and utilises hollows for nesting. *Distribution limit: N-Border Ranges National Park. S-Eden.*	n	sub optimal	n	n	not likely	x
Powerful Owl *Ninox strenua* DPIE	V	-	Forests containing mature trees for shelter or breeding and densely vegetated gullies for roosting. *Distribution limits: N-Border Ranges National Park. S-Eden.*	n	marginal	n	y	unlikely	✓
Masked Owl *Tyto novaehollandiae* DPIE	V	-	Open forest and woodlands with cleared areas for hunting and hollow trees or dense vegetation for roosting. *Distribution limit: N-Border Ranges National Park. S-Eden.*	n	marginal	n	y	unlikely	✓
White-throated Needletail MS *Hirundapus caudacutus* *DPIE EPBC*	-	V	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies often forage along favoured hilltops and timbered ranges. Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia. *Distribution limit: N-Tweed Heads. S-South of Eden.*	n	Sub optimal	n	n	not likely	x
Speckled Warbler *Chthonicola sagittata* DPIE	V	-	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. *Distribution limit: N-Urbanville. S-Eden.*	n	marginal	n	n	unlikely	x
Regent Honeyeater *Xanthomyza Phrygia* DPIE EPBC	E4A	CE	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. *Distribution limit: N-Urbanville. S-Eden.*	n	optimal	n	n	unlikely	x

White-fronted Chat *Epithianura albifrons* DPIE	V	-	Found in open damp ground, grass clumps, fencelines, heath, samphire saltmarshes, mangroves, dunes, saltbush plains. *Distribution limit: N-Tweed Heads. S-South of Eden.*	n	Sub optimal	n	n	not likely	x
Painted Honeyeater *Grantiella picta* DPIE EPBC	V	V	A nomadic bird occurring in low densities within open forest, woodland and scrubland feeding on mistletoe fruits. Inhabits primarily Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. *Distribution limit: N-Boggabilla. S-Albury with greatest occurrences on the inland slopes of the Great Dividing Range.*	n	optimal	n	n	not likely	✓
Varied Sittella *Daphoenositta chrysoptera* DPIE	V	-	Open eucalypt woodlands / forests (except heavier rainforests); mallee, inland acacia, coastal tea-tree scrubs; golf courses, shelterbelts, orchards, parks, scrubby gardens. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	n	sub optimal	y	y	low	✓
Dusky Woodswallow *Artamus cyanopterus cyanopterus* DPIE	V	-	Found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. Prefers habitat with an open understorey. Often observed in farmland tree patches or roadside remnants. *Widespread in eastern, southern and south-western Australia.*	n	optimal	n	n	low	✓
Flame Robin *Petroica phoenicea* DPIE	V	-	Summer: forests, woodlands, scrubs, from sea-level to *c.* 1800 m. Autumn-winter: open woodlands, plains, paddocks, golf courses, parks, orchards. *Distribution limit: N northern NSW tablelands. S-South of Eden.*	n	optimal	n	y	not likely	✓
Diamond Firetail *Stagonopleura guttata* DPIE	V	-	Found in eucalypt woodlands, forests and mallee where there is grassy understorey west of the Great Div. also drier coastal woodlands of the Cumberland Plain and Hunter Richmond and Clarence River Valleys. *Distribution limit: N-Rockhampton Q. S-Eyre Pen Kangaroo Is. SA.*	n	sub optimal	n	n	not likely	x
Spotted-tailed Quoll *Dasyurus maculatus* DPIE EPBC	V	E	Dry and moist open forests containing rock caves, hollow logs or trees. *Distribution limit: N-Mt Warning National Park. S-South of Eden.*	n	sub optimal	n	n	not likely	x
Koala *Phascolarctos cinereus* DPIE EPBC	V	V	Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. *Distribution limit: N-Tweed Heads. S-South of Eden.*	n	sub optimal	n	n	not likely	x

Greater Glider *Petauroides volans* EPBC	-	V	Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Population density is optimal at elevation levels at 845 m above sea level. Prefer overstorey basal areas in old-growth tree stands. Highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows *Distribution limit: N-Border Ranges National Park. S- South of Eden.*	n	sub optimal	n	n	not likely	x
Brush-tailed Rock-wallaby *Petrogale penicillata* EPBC	E	V	Found in rocky gorges with a vegetation of rainforest or open forests to isolated rocky outcrops in semi-arid woodland country. *Distribution limit: N-North of Tenterfield. S-Bombala.*	n	sub optimal	n	n	not likely	x
Grey-headed Flying-fox *Pteropus poliocephalus* DPIE EPBC	V	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy. *Distribution limit: N-Tweed Heads. S-Eden.*	y	optimal	y	y	yes	✓
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* DPIE	V	-	Rainforests, sclerophyll forests and woodlands. *Distribution limit: N-North of Walgett. S-Sydney.*	n	optimal	n	n	low	✓
Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* DPIE	V	-	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. *Distribution limit: N-Woodenbong. S-Pambula.*	n	optimal	n	y	yes	✓
Large-eared Pied Bat *Chalinolobus dwyeri* DPIE EPBC	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals. *Distribution limit: N-Border Ranges National Park. S-Wollongong.*	n	optimal	n	n	not likely	x
Eastern False Pipistrelle *Falsistrellus tasmaniensis* DPIE	V	-	Recorded roosting in caves, old buildings and tree hollows. *Distribution limit: N-Border Ranges National Park. S-Pambula.*	n	optimal	y	y	y	✓

Little Bent-winged Bat *Miniopterus australis* DPIE	V	-	Roosts in caves, old buildings and structures in the higher rainfall forests along the south coast of Australia. *Distribution limit: N-Border Ranges National Park. S-Sydney.*	y	optimal	n	n	unlikely	✓
Large Bent-winged Bat *Miniopterus orianae oceanensis* DPIE	V	-	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	n	optimal	y	y	y	✓
Southern Myotis *Myotis macropus* DPIE	V	-	Roosts in caves, mines, tunnels, buildings, tree hollows and under bridges. Forages over open water. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	y	optimal	n	y	likely	✓
Greater Broad-nosed Bat *Scoteanax rueppellii* DPIE	V	-	Inhabits areas containing moist river and creek systems, especially tree lined creeks. *Distribution limit: N-Border Ranges National Park. S-Pambula.*	y	optimal	y	y	y	✓
New Holland Mouse *Pseudomys novaehollandiae* EPBC	-	V	Occurs in heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. Coastal populations have a marked preference for sandy substrates, a heathy understorey of leguminous shrubs less than 1m high and sparse ground litter. Recolonise of regenerating burnt areas. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	n	sub optimal	n	n	not likely	x
Cumberland Plain Land Snail *Meridolum corneovirens* DPIE	E	-	Inhabits remnant eucalypt woodland of the Cumberland Plan. Shelters under logs, debris, clumps of grass, around base of trees and burrowing into loose soil. *Distribution limit: Cumberland Plain of Sydney Basin Bioregion.*	n	optimal	y	y	y	y

DPIE	- Denotes species listed within 10km of the development footprint on the *Atlas of NSW Wildlife*
EPBC	- Denotes species listed within 10km of the development footprint in the *EPBC Act* habitat search
V	- Denotes vulnerable listed species under the relevant Act
E or E1	- Denotes endangered listed species under the relevant Act
E4a or CE	- Denotes critically endangered listed species under the relevant Act
NOTE:	1. This field is not considered if no suitable habitat is present within the development footprint 2. 'records' refer to those provided by the *Atlas of NSW Wildlife*

	3. ‘nearby’ or ‘recent’ records are species specific accounting for home range, dispersal ability and life cycle
Unlikely	Represents such a low margin but not enough to 100% rule it one. A test of significance is required.
Not likely	Means 0% change of occurring, despite there being potential habitat. A test of significance is not applied to these species.

A detailed assessment in accordance with Section 1.7 of the *EPA Act* will be completed for these species in Appendix 3 of this report.

Table 11 provides an assessment of potential habitat within the study area for nationally *protected* migratory fauna species recorded within 10km on the *EPBC Act* Protected Matters Tool. Nationally *threatened* migratory species are instead considered above in Table 10.

Table 11 – Protected migratory bird habitat assessment (Appendix 2)

Common name ***Scientific name***	**Preferred habitat** ***Migratory breeding***	**Suitable habitat present (✓)**	**Recorded on site (✓)**
Oriental or Horsfield’s Cuckoo (*Cuculus optatus*)	It mainly inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.	✓	×
White-throated Needletail (*Hirundapus caudacutus*)	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies forage often along favoured hilltops and timbered ranges. *Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.*	✓	×
Rainbow Bee-eater (*Merops ornatus*)	Open woodlands with sandy, loamy soil; sandridges, sandspits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands, golf courses. *Breeding resident in northern Australia. Summer breeding migrant to south east and south west Australia.*	×	-
Black-faced Monarch (*Monarcha melanopsis*)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. *Summer breeding migrant to coastal south east Australia, otherwise uncommon*.	×	-
Yellow Wagtail (*Motacilla flava*)	The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	×	-
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. *Breeds mostly south east Australia and Tasmania over warmer months, winters in north east Qld.*	×	-
Rufous Fantail (*Rhipidura rufifrons*)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets	×	-

Common name *Scientific name*	Preferred habitat *Migratory breeding*	Suitable habitat present (✓)	Recorded on site (✓)
	buildings. *Breeding migrant to south east Australia over warmer months. Altitudinal migrant in north east NSW in mountain forests during warmer months.*		
Great Egret (*Ardea alba*)	Shallows of rivers, estuaries; tidal mudflats, freshwater wetlands; sewerage ponds, irrigation areas, larger dams, etc. *Dispersive; cosmopolitan.*	✓	×
Cattle Egret (*Ardea ibis*)	Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains. *Breeds in summer in warmer parts of range including NSW*.	✓	✓
Latham's Snipe (*Gallinago hardwickii*)	Soft wet ground or shallow water with tussocks and other green or dead growth; wet parts of paddocks; seepage below dams; irrigated areas; scrub or open woodland from sea-level to alpine bogs over 2,000m; samphire on saltmarshes; mangrove fringes. *Breeds Japan. Regular summer migrant to Australia. Some overwinter.*	✓	×
Common Greenshank (*Tringa nebularia*)	Found in a wide variety of inland wetlands and sheltered coastal habitats (with large mudflats and saltmarsh, mangroves or seagrass) of varying salinity, Habitats include embayments, harbours, river estuaries, deltas and lagoons. It uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. Also artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. In NSW the Hunter River estuary has been identified as a site of international importance. *Breeds in Eurasia, the northern British Isles, Scandanavia, east Estonia and north-east Belarus, through Russia and east.*	×	-
Osprey (*Pandion haliaetus*)	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Feeds on fish over clear, open water. Breeds from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	×	-
Fork-tailed Swift (*Apus pacificus*)	Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities. *Breeds Siberia, Himalayas, east to Japan south east Asia. Summer migrant to east Australia. Mass movements associated with late summer low pressure systems into east Australia. Otherwise uncommon.*	✓	×

APPENDICIES 3. TEST OF SIGNIFICANCE

Flora and fauna survey and habitat assessments of the study area have resulted in the identification of suitable habitat for the following threatened biodiversity that was recorded present or considered otherwise with varying potential to occur. The potential for any direct or indirect impacts on species has been considered and noted.

Table 12 – Threatened flora impact summary (Appendix 3)

Scientific name	*BC Act*	Potential to occur	Potential habitat impact
Pimelea spicata	V	✓	Indirect – removal of potential habitat

Table 13 – Threatened fauna impact summary (Appendix 3)

Common name	*BC Act*	Potential to occur	Potential habitat impact
Grey-headed Flying-fox	V	recorded	Minor reduction in foraging
Little Bent-winged Bat	V	recorded	None anticipated
Greater Broad-nosed Bat	V	recorded	Minor potential alterations in foraging behaviour
Southern Myotis	V	recorded	Minor potential alterations in foraging behaviour
Cattle Egret	under the *EPBC Act*	recorded	Minor reduction in foraging
Eastern Coastal Free-tailed Bat	V	recorded	Minor potential alterations in foraging behaviour
Cumberland Plain Land Snail	E	recorded (older records ~4 years ago)	None anticipated
Little Eagle	V	✓	None anticipated
Swift Parrot	E	✓	Minor reduction in foraging
Eastern Falsistrelle	V	✓	Minor potential alterations in foraging behaviour
Square-tailed Kite	V	low	None anticipated
Little Lorikeet	V	low	Minor reduction in low potential foraging
Varied Sittella	V	low	None anticipated
Dusky Woodswallow	V	low	None anticipated
Yellow-bellied Sheathtail-bat	V	low	None anticipated
Powerful Owl	V	unlikely	None anticipated
Masked Owl	V	unlikely	None anticipated

Common name	*BC Act*	Potential to occur	Potential habitat impact
Speckled Warbler	V	unlikely	None anticipated
Regent Honeyeater	E4A	unlikely	Minor reduction in unlikely foraging
Little Bentwing-bat	V	unlikely	None anticipated

Endangered populations

- *Marsdenia viridiflora* subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas
- *Dillwynia tenuifolia,* Kemps Creek population

Threatened ecological communities

- Cumberland Plain Woodland

BC ACT 2016 - SECTION 7.3

TEST OF SIGNIFICANCE

As outlined in Section 7.2 of the *BC Act* development or an activity is *likely to significantly affect threatened species* if:

(a) It is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in Section 7.3, or
(b) The development exceeds the threshold if the BOS applies to the impacts of the development on biodiversity values, or
(c) It is carried out in a declared area of outstanding biodiversity value.

With respect to (a) above, and outlined in Section 7.3 of the *BC Act,* the following *test of significance* is a set of five main considerations, with sub-considerations for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats.

(a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The direct and indirect impacts of the proposal are considered within Section 5.4. Given there is no direct impacts on *Pimelea spicata* and no specimens have been recorded in 2017 or 2021, no further assessment is considered necessary. The impact is only upon a very minute reduction in potential habitat.

With consideration to the relative direct and indirect impacts on all threatened species with varying potential to occur, it is considered that the proposal is unlikely to disrupt the life cycle for any of these listed species such that a viable local population would be placed at risk of extinction. Species recorded present during survey, previously recorded nearby or with high

potential to occur and requiring further discussion given potential impacts are further discussed in detail below.

Summary of threatened species recorded

Grey-headed Flying-fox (*Pteropus poliocephalus*)

Grey-Headed Flying-foxes are canopy feeding frugivores and nectarivores, inhabiting a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas. This species roosts in camps, which may contain tens of thousands of individuals.

Camps are commonly formed in gullies, typically not far from water and usually in vegetation with a dense canopy (Tidemann 1998). Camps can be found in riparian rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. Loyalty to a site is high and some camps in NSW have been used for over a century (NSW NPWS 2001). Some camps are used at the same time every year by hundreds of thousands of flying-foxes while others are used sporadically by a few hundred individuals (Strahan 1995). Generally foraging is within 20km of camps but individuals are known to commute up to 50km to a productive food source.

Grey-headed Flying-fox were recorded during survey flying over the study area during the nocturnal survey on the 6th October 2021. The development footprint provides only seasonal foraging habitat for the Grey-headed Flying-fox as no suitable roosting or subsequent breeding habitat is present. Foraging habitat is otherwise well represented in the surrounding locality such that removal of habitat will not significantly impact on a local population. It is recommended that foraging habitat is replaced by locally native flowering eucalypts within landscaping areas.

Southern Myotis (*Myotis macropus*)

The Southern Myotis inhabits rainforests and open forests containing creeks and lakes over which it feeds and roosts in tree hollows, caves, mines, under bridges, in tunnels and occasionally buildings (Richards 1995). The Southern Myotis predominantly forages along creek lines and over waterbodies where it takes insects and small fish from on and just below the water surface (Richards 1995).

This species has a strong association with streams and permanent waterways, most frequently at low elevations and in flat or undulating country and usually in areas that are vegetated rather than cleared. They will live in most habitat types as long as it is near water (Churchill 2008).

No trees containing hollows were recorded within the study site. Therefore, the proposal will not likely remove any natural roosting or subsequent breeding habitat for this species and such habitat, if present within the study area, is not likely to be indirectly impacted.

The open water dams providing the most suitable foraging habitat will be removed by the proposal. The dam is very small and there are numerous in close proximity to the site. The removal of the dam will not remove all foraging habitat but it will have an incremental impact on the local foraging habitat and value. As the breeding habitat is not impacted, a local population of this species is not likely to be significantly impacted by the proposal.

Greater Broad-nosed Bat (*Scoteanax rueppellii*)

Greater Broad-nosed Bats roost in hollow tree trunks and branches as well as the roofs of old buildings. They prefer moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill, 1998). They have also been found to inhabit cool temperate to

tropical moist hardwood forest and woodland and in gullies associated with these forest types (Richards, 1991; Strahan, 1992; Churchill, 1998). Has been commonly found at woodland clearing ecotones foraging over the understorey (Richards, 1991).

Emerging just after sundown the Greater Broad-nosed Bat usually flies directly and slowly at a height of 3-6m. The Greater Broad-nosed bat predominately forages at this height, deviating only slightly from its flight path to catch beetles and other slow flying insects. Recent evidence shows that it feeds on small vertebrates and other small bats (Strahan, 1988).

Given that this uncommon species' known ability to inhabit a wide range of habitats, the surrounding landscape provides sufficient roosting and foraging habitat that is otherwise not recorded within the prosed development footprint. It is then predicted that the proposed development will not inhibit local movements and dispersal of the extant population. Therefore, this species will not likely be significantly impacted by the proposed development.

Little Bent-winged Bat (*Miniopterus australis*)

The Little Bent-winged Bat forages below the canopy within open forests and woodlands, feeding on small insects (Dwyer 1995b). This species roosts in caves, tunnels, tree hollows and occasionally old buildings (Dwyer 1995b). Caves are an important resource for this species, particularly for breeding where maternity caves must have suitable temperature, humidity and physical dimensions to permit breeding (Dwyer 1995b). One record exists of this species utilising a tree hollow however hollows are not currently considered as preferred habitat for this species (pers. com. Brad Law).

It is considered that the development footprint does not provide suitable foraging and roosting habitat for the Little Bent-winged Bat. The Little Bent-winged Bat would forage more predominantly below the canopy where an open structure below the shrub layer permits. Concentrated activity is likely in some locations such as along the creek, forest fringes and trails.

Whilst foraging by this species may be more concentrated in some habitats (most based on structure and insect activity) no specific valued habitat features within the areas pertaining to proposal site are identified.

Given the highly mobile nature of this species and their known ability to move across and utilise some urban landscapes it is predicted that the proposed development will not inhibit local movements and dispersal. Therefore, this species will not likely be significantly impacted by the proposed habitat clearance. The development footprint is not located within an area containing caves or similar structures that may be used for breeding.

Eastern Coastal Free-tailed Bat (*Micronomus nolfolkensis*)

The Eastern Coastal Free-tailed Bat forages above the canopy of open forests and woodlands and in clearings at forest edges, feeding on small insects (Allison, Hoye & Law 2008). This species is thought to roost predominantly in tree hollows but also under loose bark and occasionally in houses and outbuildings (Allison, Hoye & Law 2008). Until recent findings of a roost within mangroves, all known natural roosts had occurred within hollow spouts of large mature eucalypts. The species is often found close to dams and waterholes. The Eastern Coastal Free-tailed Bat species will utilise paddock trees and isolated remnant vegetation when in proximity to larger forest remnants (Allison, Hoye & Law 2008).

This is a highly mobile species and local habitat would not be exclusive to the lot as it part of a larger patch of contiguous vegetation.

There are no hollows proposed for removal by the development, therefore not likely to impact on breeding habitat nor impacting the life cycle of the species such that it may be placed at risk of extinction.

Cumberland Plain Land Snail (*Meridolum corneovirens*)

Meridolum corneovirens is wholly restricted to western Sydney and is primarily associated with the Cumberland Plain and Castlereagh Woodland vegetation types (Clark 2009). The species occasionally occurs along the edges of Coastal River Flat Forest, where it meets either of the above forest types. *M corneovirens* occurs generally in areas characterised by moist soils together with growths of various species of lichen. This species is known to shelter under logs, other debris, and in leaf litter or around the base of trees where exfoliations occur. Where conditions permit it will bury into loose soil especially under logs and around the bases of large trees (Clark (2009).

Spatial autocorrelation analysis indicates that *M. corneovirens* populations are highly structured at very short distances (2 m) and that the radius of a genetic neighbourhood is approximately 350 m (Clark & Richardson 2002).

Records of the species were only noted in the riparian zone which is at least 200 m south of the development footprint. Within the development footprint there is very little leaf litter or refuge that would be suitable for the species. As such, with the development footprint the potential for occurrence is low. Despite searches in select locations as shown on Figure 6, no specimens were detected.

It was considered unlikely that the proposal will have an impact on the lifecycle of the species such that it may be placed at risk of local extinction.

(b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

The proposal will not see a reduction in area of any PCT 850, Cumberland Plain Woodland within the lot.

It is therefore considered that the proposed development is unlikely to have an adverse effect on the extent of any ecological community such that its local occurrence is likely to be placed at risk of extinction.

ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The proposed asset protection zone off the southern side of the main building has been reduced to ensure that no vegetation modification is required on the adjoining PCT 850, Cumberland Plain Woodland.

(c) In relation to the habitat of threatened species or ecological community:

It is considered that the habitat attributes of the development footprint provide known or potential habitat for *Pimelea spicata,* Cumberland Plain Woodland*,* Cumberland Plain Land Snail*,* Green and Golden Bell Frog, Little Eagle, Spotted Harrier, Gang-Gang Cockatoo, Little

Lorikeet, Swift Parrot, Turquoise Parrot, Southern Myotis, Painted Honeyeater, Dusky Woodswallow, Regent Honeyeater, Koala, Grey-headed Flying-fox, Large-eared Pied Bat, Eastern False Pipistrelle, Greater Broad-nosed Bat, Little Bent-winged Bat, Large Bent-winged Bat, Eastern Coastal Free-tailed Bat and Yellow-bellied Sheathtail-bat.

i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposal will not impact PCT 850 vegetation which is the conduit for the majority of the species. PCT 1071 impact (the dam and fringing macrophytes) covers an area of 0.08 ha. This is really only suitable for use by the Southern Myotis and only as a foraging resource.

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

The proposal will not sever any areas of connected vegetation, isolate or fragment patches of habitat / vegetation for any of the threatened species found to utilise the site or potentially utilise the site.

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

In respect to threatened fauna species recorded or with potential to occur the proposed area of impact is not likely of high quality, of any breeding importance or central to the home range requirements of any species such that behaviour or ecology of these species will not be significantly altered in any way.

The development footprint is sited on a cleared and managed landscape. The main impact will be removal of the existing dam and fringing vegetation. This will have minimal impact on the local habitat. The dam vegetation is not part of an any threatened ecological community nor is it vegetatively connected to other landscapes.

The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population and ecological communities in the locality is considered to be minimal.

(d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The development footprint is not within any declared area of outstanding biodiversity value. Therefore, the proposal will not have any adverse effects on any declared area of outstanding biodiversity value (either directly or indirectly).

(e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A key threatening process is defined as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities.

The current list of key threatening processes, and whether the proposed activity is recognised as a threatening process, is shown below.

Table 14 – Key threatening processes (Appendix 3)

Listed key threatening process	Development a threatening process?		
	Likely	Possible	Unlikely
Aggressive exclusion of birds by Noisy Miners (*Manorina melanocephala*)			✓
Alteration of habitat following subsidence due to longwall mining			✓
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands			✓
Anthropogenic Climate Change			✓
Bushrock removal			✓
Clearing of native vegetation	✓		
Competition and habitat degradation by feral goats		✓	
Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)		✓	
Competition from feral honeybees			✓
Death or injury to marine species following capture in shark control programs on ocean beaches			✓
Entanglement in, or ingestion of anthropogenic debris in marine and estuarine environments			✓
Forest Eucalypt dieback associated with over-abundant psyllids and bell miners		✓	
High frequency fire resulting in the disruption of life-cycle processes in plants and animals and loss of vegetation structure and composition			✓
Herbivory and environmental degradation caused by feral deer		✓	
Importation of red imported fire ants into NSW			✓
Infection by *Psittacine circoviral* (beak and feather) disease affecting endangered psittacine species and populations			✓
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis			✓
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae		✓	
Infection of native plants by *Phytophthora cinnamomi*		✓	
Introduction of the large earth bumblebee (*Bombus terrestris*)			✓
Invasion and establishment of exotic vines and scramblers			✓
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)			✓
Invasion and establishment of the Cane Toad (*Bufo marinus*)			✓
Invasion, establishment and spread of *Lantana camara*			✓
Invasion of native plant communities by bitou bush & boneseed *Chrysanthemoides monilifera*			✓

Listed key threatening process	Development a threatening process?		
Invasion of native plant communities by exotic perennial grasses			✓
Invasion of native plant communities by African Olive (*Olea europaea* subsp. *cuspidata*)			✓
Invasion of the Yellow Crazy Ant (*Anoplolepis gracilipes*)			✓
Loss of Hollow-bearing trees			✓
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants			✓
Loss and/or degradation of sites used for hill-topping by butterflies			✓
Predation and hybridisation by feral dogs (*Canis lupus familiaris*)			✓
Predation by the European Red Fox (*Vulpes vulpes*)			✓
Predation by the Feral Cat (*Felis catus*)			✓
Predation by Gambusia holbrooki Girard, 1859 (plague minnow or mosquito fish)			✓
Predation by the Ship Rat (*Rattus rattus*) on Lord Howe Island			✓
Predation, habitat degradation, competition & disease transmission from Feral pigs (*Sus scofa*)			✓
Removal of dead wood and dead trees		✓	

The above key threatening processes have been considered in reference to the proposal. It was considered that the proposal may contribute to a small degree to a number these processes as described below. It was not considered that the proposal will not have a significant impact on any of the following key threatening processes. Some mitigation measures have been listed under each process to minimise or reduce such impacts upon those processes.

Summary of "likely" or "possible" Key Threatening Processes

This section identifies what mitigation measures can be implemented to address threatening processes.

Clearing of native vegetation

0.08 ha of dam and fringing vegetation will be removed by the proposal. The vegetation is not part of any listed threatened ecological community. Future site landscaping with endemic native species can be utilised to replace this feature.

Infection of native plants by Phytophthora cinnamomi

The proposal may temporarily increase the risk of fungal infection on site as it may be spread via vehicular movement and relocation of soil and vegetation. Consequently, standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres or tracks. Any equipment found to contain soil or vegetation material from offsite is to be cleaned in a quarantined work area or wash station and treated with anti-fungal pesticides prior to commencing work.

Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae

'Myrtle Rust' may be spread via machinery, animals and humans as well as by environmental factors such as wind. The presence of machinery and construction works is likely to slightly increase the potential for spread of this key threatening process. Similar protocols as to *Phytophthora cinnamomi* should be applied.

Removal of dead wood and dead trees

The proposal may require the removal of deadwood on existing isolated and landscape trees and as such would be a class of development recognised as a threatening process. Threatened fauna species with potential habitat within the subject site and likely dependent on dead wood or dead trees include Speckled Warbler, Black-chinned Honeyeater, Varied Sittella, Dusky Woodswallow and Cumberland Plain Land Snail. Of these species the Cumberland Plain Land Snail had been recorded previously by *Travers bushfire & ecology* in 2017 within the study area and has abundant recent and near-by sightings recorded in all directions surrounding the study site. It is recommended that no removal of deadwood and dead trees within the key habitat areas for retention for these species. Deadwood to be removed from the subject site should be relocated into the retained riparian area to facilitate additional Cumberland Plain Land Snail shelter and thus threatened species use.

APPENDICIES 4. EPBC SIGNIFICANCE ASSESSMENT CRITERIA

EPBC ACT SIGNIFICANCE ASSESSMENT CRITERIA

Under the *EPBC Act* an action will require approval from the Australian Government Environment Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. The following significant impact criteria were sourced from the *EPBC Act* Policy Statement 1.1 (May 2006):

CRITICALLY ENDANGERED AND ENDANGERED SPECIES

Significant impact criteria

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

- Lead to a long-term decrease in the size of a population;
- Reduce the area of occupancy of the species;
- Fragment an existing population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of a population;
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;
- Introduce disease that may cause the species to decline; or
- Interfere with the recovery of the species.

What is a population of a species?

A 'population of a species' is defined under the *EPBC Act* as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

What is habitat critical to the survival of a species or ecological community?

- What is habitat critical to the survival of a species or ecological community?
- 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:
- • For activities such as foraging, breeding, roosting, or dispersal;
- • For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- • To maintain genetic diversity and long-term evolutionary development; or
- • For the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the *EPBC Act.*

VULNERABLE SPECIES

Significant impact criteria

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;
- reduce the area of occupancy of an important population;
- fragment an existing important population into two or more populations;
- adversely affect habitat critical to the survival of a species;
- disrupt the breeding cycle of an important population;
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- introduce disease that may cause the species to decline; or
- interfere substantially with the recovery of the species.

What is an important population of a species?

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range.

CRITICALLY ENDANGERED AND ENDANGERED ECOLOGICAL COMMUNITIES

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- Reduce the extent of an ecological community;
- Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- Adversely affect habitat critical to the survival of an ecological community;
- Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    - assisting invasive species, that are harmful to the listed ecological community, to become established; or
    - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
- Interfere with the recovery of an ecological community.

MIGRATORY SPECIES

Significant impact criteria

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

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

What is important habitat for a migratory species?

An area of 'important habitat' for a migratory species is:

a) Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
b) Habitat that is of critical importance to the species at particular life-cycle stages; and/or
c) Habitat utilised by a migratory species which is at the limit of the species range; and/or
d) Habitat within an area where the species is declining.

What is an ecologically significant proportion?

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates).

What is the population of a migratory species?

'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

APPENDICIES 5. MICROBAT CALL ANALYSIS

SUMMARY OF RESULTS			
ID Method	**Result**	**Threatened**	**Confidence (Probability low to high)**
Alternating pulses	*Chalinolobus gouldii*	*x*	High
Characteristic frequency	*Scoteanax rueppellii*	✓	High
Characteristic frequency	*Tadarida australis*	*x*	High
Steep near vertical pulse	*Miniopterus australis*	✓	High
Characteristic frequency	*Myotis macropus*	✓	High
Down-sweeping tail	*Chalinolobus morio*	*x*	High

HABITAT & SURVEY CONDITIONS
Survey was conducted in an open habitat with no rain, no wind, almost no cloud cover and the temperature was 18°C.

METHOD DESCRIPTION
Two Anabat Swift (full-spectrum) with omnidirectional microphones were used to record bat calls. All recorded files were run through a decision tree in Anabat Insight which filtered out non-bat files and labelled bat files with either a species or species complex. Each automatically labelled file was then manually verified. The call from each species/species complex that was most confidently identified was selected to be used as the image in the “Results” section of this report. All images were taken from within Anabat Insight and shown in either compressed or uncompressed mode, depending on which image best highlights diagnostic features. All full-spectrum recordings are shown in full-spectrum with a zero-crossing overlay.

CALL REFERENCE LIBRARY
Calls were identified using the “Bat Calls of NSW” by Pennay *et al*. (2004) regional guide, the “Key to the bat calls of south-east Queensland and north-east New South Wales” by Reinhold *et al*. (2001), and the “Bat Calls of Central Eastern NSW” by Titley Scientific (2009). Additional call metrics were also been collected for specific bat species from discussions with recognised bat experts including Michael Pennay, Brad Law and Greg Ford.

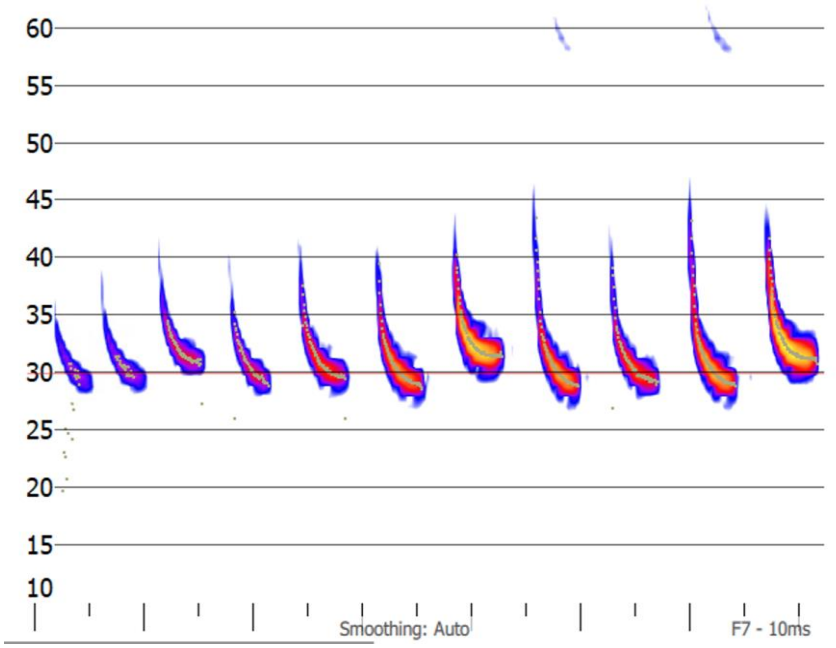
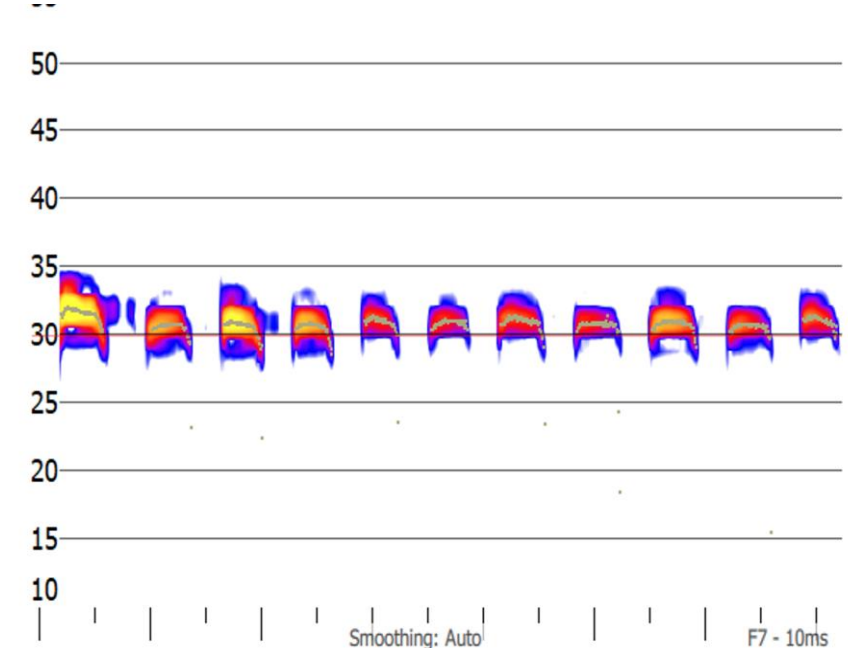
RESULTS	
The calls of seven species were identified from the Mount Vernon recordings. Three threatened species; *Scoteanax rueppellii,*(Figure 3), *Miniopterus australis* (Figure 5) and *Myotis macropus* (Figure 6) were identified.	
Figure 1: Gould's Wattle Bat (*Chalinolobus gouldii*) in uncompressed mode. This sequence was identified as *C. gouldii* call due to the alternating characteristic frequency, long frequency sweep and down-sweeping tail.	
Figure 2:	

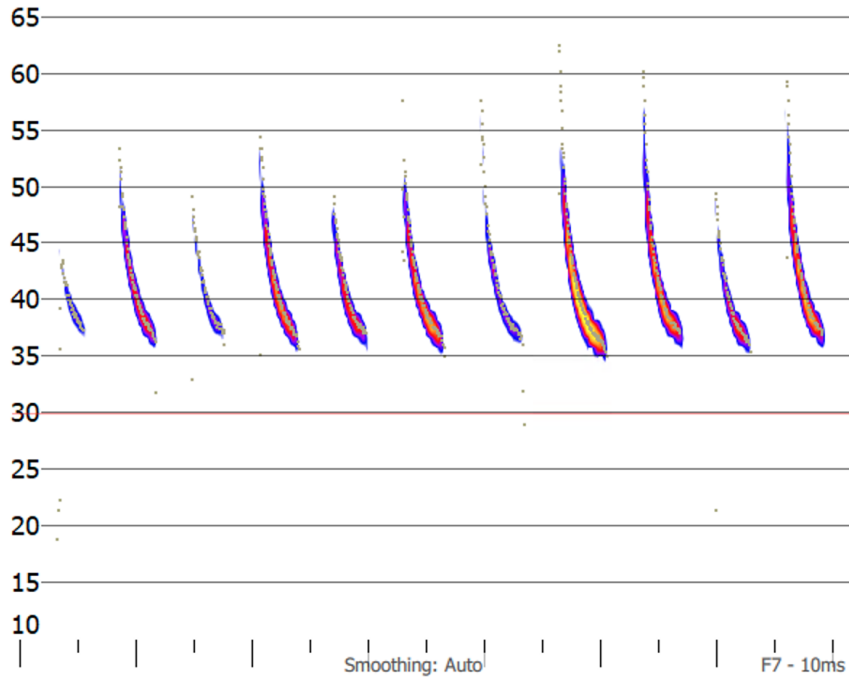
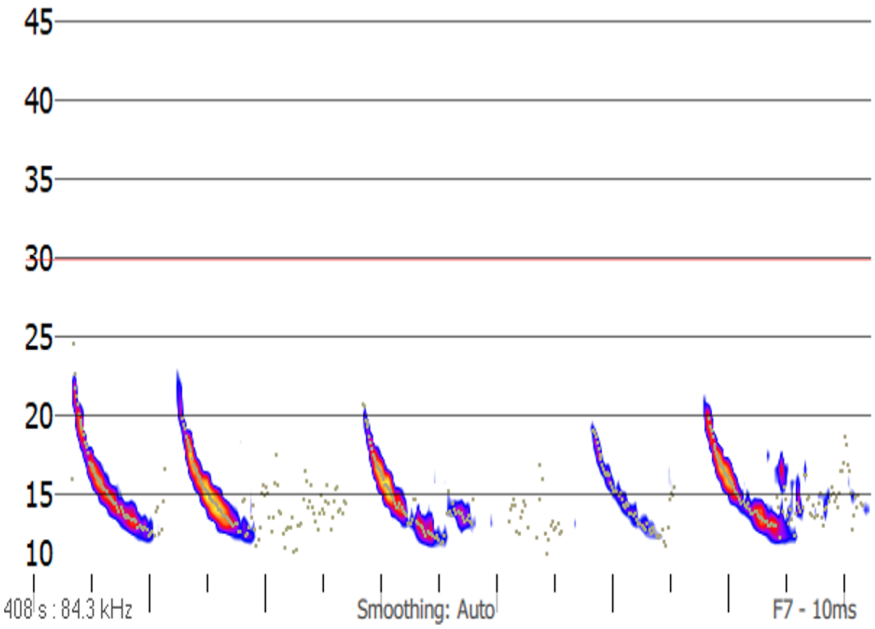
Figure 3: Greater Broad-nosed Bat *(Scoteanax rueppellii)* This sequence was identified as a *S. rueppellii* call due to the short down-sweeping tail and the frequency of the knee being higher than 37kHz.	
Figure 4: White-striped Free-tailed bat (*Tadarida australis)* This sequence was identified as a *T. australisi* call due to the flat but sloped pulse, irregular frequency and low characteristic frequency of 10 – 15 kHz.	

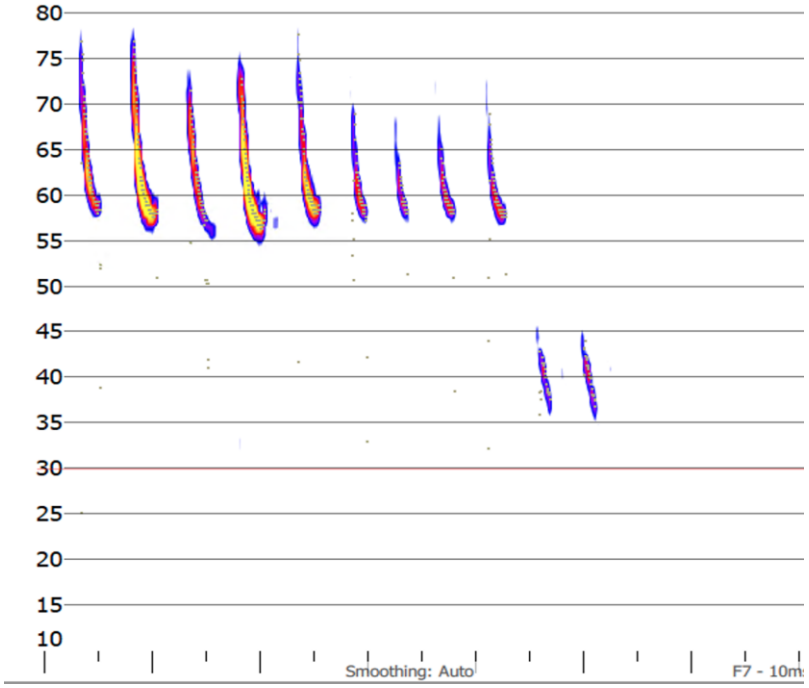
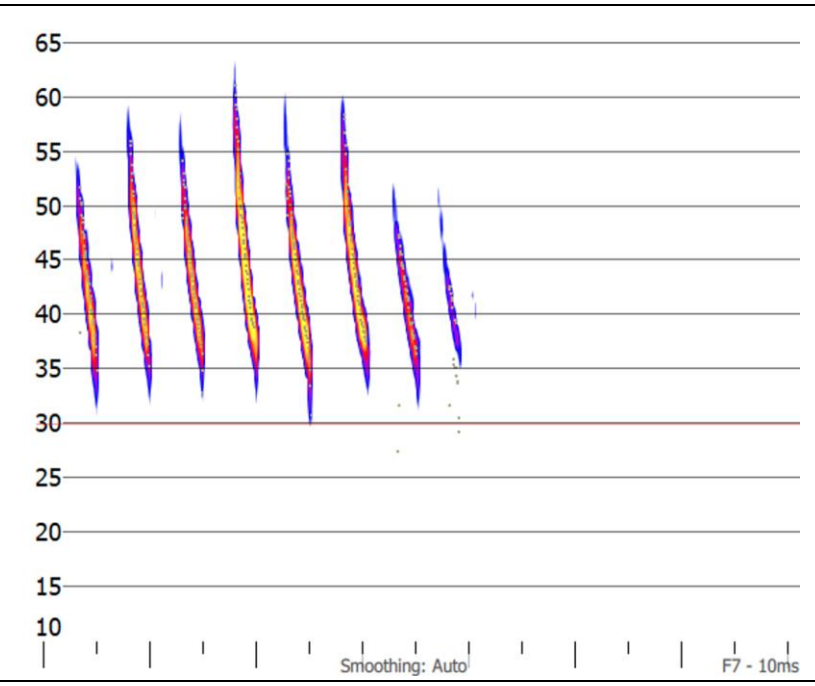
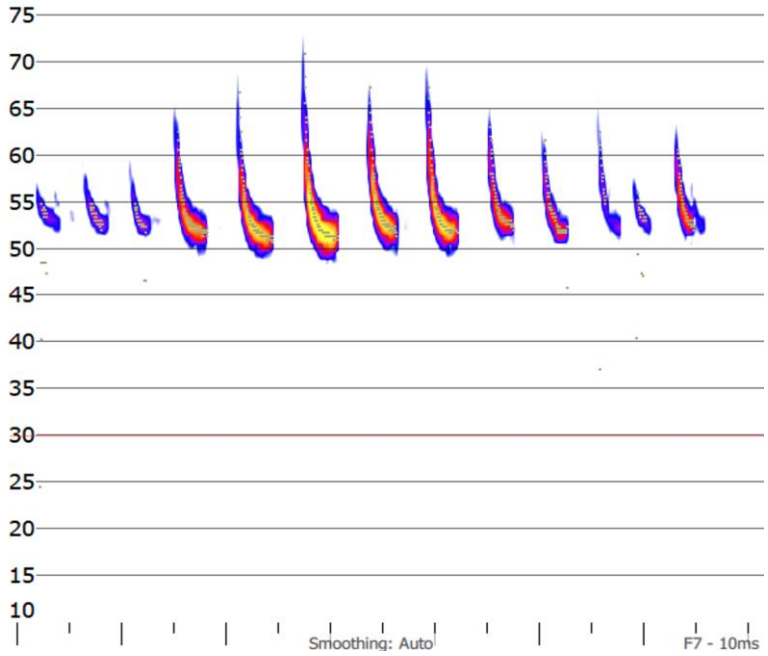
Figure 5: Little Bent-winged Bat (*Miniopterus australis)* This sequence was identified as a *M. australis* call due to the curved downward sweeping tail. This species also identified by having a higher characteristic frequency than any other species which exhibit curved pulses.	
Figure 6: Southern Myotis (*Myotis macropus)* This sequence was identified as a *M. marcropus* call due to the steep, near vertical pulse, showing a kink prior to the tail at around 35kHz.	

Figure 7: Chocolate Wattled Bat (*Chalinolobus morio*) This sequence was identified as a C*. morio* call due to the curved pulse, showing a downward sweeping tail with slight alternation observed between pulses.	
Assessing officer: **Corrine Edwards** Date**: 18/10/2021** Scientific Licence: **SL100848**	