Great Western Highway East – Katoomba to Blackheath Upgrade

Revised Biodiversity Assessment Report

Transport for NSW | October 2022

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Transport for NSW (TfNSW) proposes to upgrade about 5.6 kilometres of the Great Western Highway between Katoomba to Medlow Bath and Medlow Bath to Blackheath to a four-lane divided road, inclusive of bridges and connection (the proposal). The proposal is located within the Blue Mountains City Council local government area (LGA) in the upper Blue Mountains, New South Wales (NSW).

Niche Environment and Heritage Pty Ltd (Niche) was commissioned to prepare a Biodiversity Assessment Report (BAR) to support the Review of Environmental Factors (REF) for the proposal.

This BAR complies with the Biodiversity Assessment Methodology (BAM) (DPIE 2020a) to adequately assesses potential impacts to threatened biodiversity listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The BAM was applied to the assessment as it is considered a consistent and rigorous methodology used for the assessment of biodiversity values across NSW.

After the completion of the REF and the BAR, further design changes were identified that resulted in a change in the proposal area. This revised proposal area (and, therefore, revised construction footprint), included an additional section outside of the REF proposal area near Blackheath, to incorporate proposed access trails and associated utility installation works. This revised BAR aims to address these additional impacts and providing a whole of project assessment to wholistically assess the biodiversity impacts of the revised proposal. This revised BAR would support the Submissions Report for the proposal.

The REF proposal area was about 83.92 hectares in size. It includes the operational footprint consisting of the East Upgrade, associated median, drainage and all associated infrastructure for the ongoing operation of the proposal. The revised proposal area is directly south of the Evans Lookout Road turnoff at Blackheath. This additional area would result in an additional 3.19 hectares of direct/indirect impacts to native vegetation from that assessed in the REF (and original BAR).

Methodology

Field survey was completed across multiple months in accordance with the BAM and relevant threatened biodiversity survey guidelines. Data from preliminary surveys conducted by Niche in Spring 2020 (Niche 2021 a, b, c) was used to inform/supplement the assessment. The study area included the area that will be subject to direct impacts (REF proposal area and the revised proposal area) and some areas of potential habitat beyond those boundaries.

Surveys completed include:

- Floristic and BAM plots to determine Plant Community Type (PCT) and condition
- Habitat mapping (hollow-bearing tree survey, watercourses, rocky outcrops, fallen woody debris and ground refugia, feed trees, nests)
- Spotlighting for nocturnal mammals and birds (Winter 2021, Spring 2021, Winter 2022)
- Stagwatching (hollow watching) for nesting Glossy Black-Cockatoos (Spring 2021)
- Stagwatching (hollow watching) for nesting Gang-gang Cockatoos (Summer 2021)
- Terrestrial baited camera trapping (Spring 2020, Summer 2021/2022)
- Anabat deployment and analysis (Spring 2020, Summer 2021)
- Opportunistic fauna observations (all field campaigns)
- Targeted threatened flora survey (Spring 2020, Winter 2021, Spring 2021, Summer 2021, Autumn 2022 and Winter 2022)
- Targeted survey for Giant Dragonfly (*Petalura gigantea)* in Blue Mountains Swamp habitat (Summer 2021)
- Targeted survey for Blue Mountains Water Skink (*Eulamprus leuraensis)* (Summer 2021).

Results

About 68.80 hectares (ha) of native vegetation and associated habitat, and 15.12 hectares of non-native vegetation (comprising the existing Great Western Highway, services, footpaths, cleared areas) occurs within the study area (83.92 ha in total).

The native vegetation has been subject to varying levels of historical clearing and edge effects from the existing Great Western Highway, Railway corridor and surrounding residential development.

The native vegetation comprises the following three Plant Community Types (PCTs) in low to moderate condition:

- PCT 1248 *Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion*
- PCT 967 *Narrow-leaved Peppermint - Silvertop Ash - Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion*
- PCT 1078 *Prickly Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion*.

One threatened flora species, Needle Geebung (*Persoonia acerosa*) was recorded within the southern portion of the revised proposal area.

Eight threatened fauna species were recorded during field surveys:

- Eastern Pygmy-possum (*Cercartetus nanus*)
- Large Bentwing-bat (*Miniopterus orianae oceanensis*)
- Little Bentwing-bat (*Miniopterus australis*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*,
- Eastern Freetail Bat (*Micronomous norfolkensis*)
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*).

Potential impacts

The proposal would result in the direct impact of up to 47.56 hectares of vegetation within the REF proposal area and 2.45 hectares of vegetation within the revised proposal area (50.01 hectares in total), regarded as ‘native vegetation’ (as defined in the BAM). The majority of vegetation likely to be affected by the proposal is located adjacent to the Great Western Highway and has been subject to historic clearing and edge effects. It is also therefore thinned in areas and some areas are dominated by a range of introduced species. Up to 220 hollow-bearing trees will be removed.

One Threatened Ecological Community (TEC), one threatened flora and 25 threatened fauna species were identified with a moderate to high likelihood of occurrence or their potential presence generated by the BAM-Calculator. As such, assessments of the significance of potential impacts were undertaken for each of these species in accordance Section 7.3 of the BC Act and the EPBC Act Commonwealth MNES Significant Impact Guidelines (DAWE 2013).

Avoid, minimise and mitigate

TfNSW have aimed to avoid and minimise environmental impacts from the proposal as far as practical through options analysis and design refinement to reduce impacts. A series of mitigation measures to manage direct and indirect impacts from the proposal would also be employed in accordance with TfNSW Biodiversity Guidelines (TfNSW 2011).

Design refinement opportunities were limited between Katoomba and Medlow Bath due to topography and geology of the place, however, the following design refinements were achieved for the purpose of biodiversity impact avoidance and mitigation:

- A design workshop was conducted in August 2021, to identify areas where fauna sensitive road design options would be achievable. As a result, it is proposed that Glider Poles could be installed in the vicinity of Pulpit Hill to minimise potential impact to the Greater Glider.

- A design workshop was held in September 2021, in an effort to avoid direct impact to an identified patch of Blue Mountains Swamp (swamp) TEC. A swamp about 1.15 ha in size occurs to the west of the existing highway in the south of the REF proposal area to the north of Pulpit Hill. To avoid direct impacts to the swamp, the bridge design was amended such that the eastern-most extent of the swamp would fall in the middle of the span between two piers, to maximise the distance between the swamp and the bridge piers. As such, the bridge piers (and access track for construction works) will avoid directly impacting on the swamp.
- The Eastern Pygmy-possum was recorded at seven locations, either side of the existing highway in December 2021 and January 2022. In lieu of any other information regarding the size/extent of the population beyond the Study Area, an Eastern Pygmy-possum survey and monitoring program is to be developed for the broader locality to better understand the size and extent of the local population (and further inform the impact assessment – see below).
- The monitoring program will include the installation of the nest boxes in areas outside the REF proposal area, which will also potentially provide suitable supplementary nesting habitat, and better inform proposed mitigation measures.

Test of significance assessments under Section 7.3 of the BC Act

Test of significance assessments under Section 7.3 of the BC Act were completed for one threatened flora, 24 threatened fauna species and one TEC identified with the potential to occur or be impacted by the proposal. In accordance with the assessment criteria, and upon implementation of proposed mitigation measures and habitat compensation measures, the proposal was considered unlikely to have a significant impact on all but one of the threatened species assessed. The Eastern Pygmy-possum was considered to have the potential to be significantly affected by the REF proposal. In accordance with the assessment criteria, the area of Eastern Pygmy-possum habitat to be removed as part of the proposal is considered likely to be important for all stages of the species' life cycle for the relatively small number of individuals known to be a part of the local population. In lieu of any data regarding the presence of additional individuals beyond the REF proposal area (and thus evidence of the presence of a larger/more extensive population), the proposal is considered likely to have a direct impact on Eastern Pygmy-possum habitat, such that the viable local population(s) may be placed at risk of extinction.

A survey and monitoring program for the Eastern Pygmy-possum will be developed to better understand the extent of the population and whether there are additional individuals beyond the REF proposal area. The findings will be used to determine whether the proposal is likely to have significant impact on the local population(s).

The preparation of a Species Impact Statement (SIS) or entry into the NSW Biodiversity Offset Scheme (BOS) will be required if it is determined that a significant impact to the Eastern Pygmy-possum as a result of the proposal is likely. Otherwise, impacts to biodiversity will be offset according to TfNSW offset policy.

Significant Impact Criteria for Matters of National Environmental Significance (MNES) (EPBC Act)

An assessment of significance under the EPBC Act was completed for one threatened flora species, four threatened fauna species and one TEC identified with the potential to occur or be impacted by the proposal. The assessments concluded that, upon implementation of proposed mitigation measures and habitat compensation measures, significant impacts to MNES were unlikely. Given the proposal is being undertaken by TfNSW under Division 5.1 of the EP&A Act, the strategic assessment applies, and no further Referral or associated offsets under the Commonwealth are required.

Glossary

Definitions	
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity offsets	Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of proposal (OEH 2017).
Calculator	BAM Credit Calculator. An online application of the Biodiversity Assessment Method (BAM). The calculator uses the rules and calculations outlined in the BAM and allows the user to apply the BAM at a site and observe the results of the assessment.
REF proposal area	The area to be directly impacted by the proposal during construction activities. Analogous with subject land (see definition for subject land).
revised proposal area	The additional construction area that was added to the Original REF proposal during design/scope iterations in July 2022 and is to be directly impacted during construction activities.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat, and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation)
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.
Indirect impact	Indirect impacts include but not limited to: (a) indirect impacts on adjacent vegetation and habitat during construction (b) indirect impacts on adjacent vegetation and habitat during operation (c) impacts on adjacent vegetation and habitat arising from a change in land-use patterns (OEH 2017)
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately (OEH 2017).
MNES	A matter of national environmental significance (MNES) protected by a provision of Part 3 of the EPBC Act
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (OEH 2017).
Mitigation	Action to reduce the severity of an impact.

Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality or injury.
Native vegetation	(a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act).
Population	A group of organisms, all of the same species, occupying a particular area (BAM 2017).
Study area	The area directly affected by the proposal and any additional areas likely to be affected by the proposal, either directly or indirectly (OEH 2017).
Target species	A species has been identified within the study area or is considered to have a moderate to high likelihood of occurrence and may be impacted by the proposal.

Abbreviations	
BAM	Biodiversity Assessment Method (OEH 2017)
BC Act	Biodiversity Conservation Act 2016
BOS	Biodiversity Offset Scheme under the BC Act
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DoEE	Former Commonwealth Department of Environment and Energy
DPIE	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
EEC	Endangered ecological community
EES	Environment Energy and Science Group, Department of Planning, Industry and Environment
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth).
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service
OEH	Former NSW Office of Environment and Heritage
PCT	Plant Community Type
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
TECs	Threatened Ecological Communities
TBDC	Threatened Biodiversity Data Collection
TfNSW	Transport for NSW
VEC	Vulnerable Ecological Community
VIS	Vegetation information system

1 Introduction

Transport for NSW (Transport) is proposing to widen the Great Western Highway, from one to two lanes in each direction, between Katoomba (Rowan Lane) and Blackheath (Tennyson Road) (the proposal). The proposal is part of the Great Western Highway Upgrade Program which aims to provide a safer, more efficient connection between the Central West region of New South Wales (NSW), the Blue Mountains and Sydney.

The proposal consists of two sections:

- Katoomba to Medlow Bath – about 3.5 kilometres of highway between Rowan Lane at Katoomba and Bellevue Crescent at Medlow Bath
- Medlow Bath to Blackheath – about 1.8 kilometres of highway between Station Street at Medlow Bath and Tennyson Road at Blackheath.

Transport prepared a review of environmental factors (REF) to assess the potential environmental impacts of the proposal.

Following exhibition of the REF, the proposal design has been refined (referred to as 'the revised design') in response to stakeholder feedback and further design development to either realise social benefits earlier or to allow construction efficiencies.

Figure 1-1 indicates the locations where design changes are proposed in the revised design compared to the design outlined in the REF.

The design changes in the revised design include:

- Extending the new separate eastbound carriageway and the upgrade of the westbound carriageway to connect back to the existing Great Western Highway just to the east of Tennyson Road.
- Continuing the active transport trail in the Medlow Bath to Blackheath section to Valley View Road, Blackheath. The active transport trail would also serve as maintenance access to utilities, water quality basins and the national park (for approved access only).
- High voltage electricity, optical fibre and water main relocations between Medlow Bath and Blackheath have been extended and connected back to existing utility networks at Blackheath.

The revised design would require an extension to the REF proposal area at the western end of the Medlow Bath to Blackheath section only. The revised proposal area has been developed as the footprint required for the construction of the revised design.

This revised Biodiversity Assessment Report (BAR) has been prepared to assess the potential biodiversity impacts of the revised design. It will support a Review of Environmental Factors (REF) being prepared by Transport under Division 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

1.1 Proposal background

The Federal and NSW Governments are investing more than $4.5 billion towards the Great Western Highway Upgrade Program which proposes to upgrade the remaining 34 kilometres of the Great Western Highway to four-lane divided highway between Katoomba and Lithgow.

The Great Western Highway Upgrade Program will reduce congestion, deliver safer, more efficient and reliable journeys for those travelling in, around and through the Blue Mountains, and better connect communities in the Central West. The proposal would contribute to the overall objectives of the Great Western Highway Upgrade Program.

Subject to approval, construction of the proposal could commence in 2023 with early work, however the main construction is anticipated to commence from late 2024 and last for a period of about:

- 36 months for the Katoomba to Medlow Bath section
- 30 months for the Medlow Bath to Blackheath section.

The proposal is the Great Western Highway East – Katoomba to Blackheath Upgrade. Other projects of the Great Western Highway Upgrade Program are being developed and assessed separately.

1.2 The REF proposal and revised proposal area

Transport prepared an REF to assess the potential environmental impacts of the proposal (referred to as 'the original design'). After public exhibition of the REF, the proposal design was refined (referred to as 'the revised design'). Figure 1-2 indicates the REF proposal area and the locations where design changes are proposed in the revised design compared to the design outlined in the REF (referred to as the revised proposal area).

1.2.1 Design refinement (avoidance and mitigation of impact)

While design refinement opportunities were limited between Katoomba and Medlow Bath due to topography and geology of the place, the following design refinements were achieved for the purpose of biodiversity impact avoidance and mitigation:

- A design workshop was conducted in August 2021, to identify areas where fauna-sensitive road design options would be achievable. It was determined that, due to significant geological and topographical constraints, there is limited opportunity to provide fauna connectivity structures (such as box culverts (or the like) beneath the road for terrestrial species or glider poles for arboreal species). One location, in the vicinity of Pulpit Hill was identified as a potentially suitable location for glider poles. Installation of glider poles in this location has been considered in relation to minimising impacts to the Greater Glider (*Petauroides Volans).*
- A design workshop was held in September 2021, in an effort to avoid direct impact to an identified patch of Blue Mountains Swamp (swamp) Threatened Ecological Community (TEC). A swamp about 1.15 hectares in size occurs to the west of the existing highway in the south of the REF proposal area to the north of Pulpit Hill. The proposal includes a bridge with pier locations spanning this area. In order to avoid direct impacts to the swamp and maximise the distance between the swamp and the bridge piers, the bridge design was amended such that the eastern-most extent of the swamp would fall in the middle of the span between two piers. As such, the bridge piers (and access track for construction works) will avoid directly impacting on the swamp.
- After further design refinement in July 2022, the works proposed along Evans Lookout Road, and the southern portion of Valley View Road will include upgrading the existing overhead electrical wires. Therefore, no additional ground disturbance/ civil works will be required. Only minor trimming of vegetation would be required.

1.3 Defining the REF proposal area, the revised proposal area and the study area

The ‘REF proposal area’ for the works contains all areas proposed for ground disturbance (including construction and operation) and encompasses the key infrastructure elements as summarised in section 1.2 and detailed in the REF for the proposal (Figure 1-1 and Figure 1-2).

The REF proposal area is about 83.92 hectares in size. It includes the operational footprint consisting of the East Upgrade, associated median, drainage and all associated infrastructure for the ongoing operation of the proposal. The REF proposal area also includes emplacement areas for temporary ancillary facilities to support construction including compound sites, drainage basins, stockpile and laydown locations, temporary access tracks, temporary waterway crossings and concrete batching plants.

Biodiversity investigations were conducted across an area broader than the REF proposal area, known as the study area.

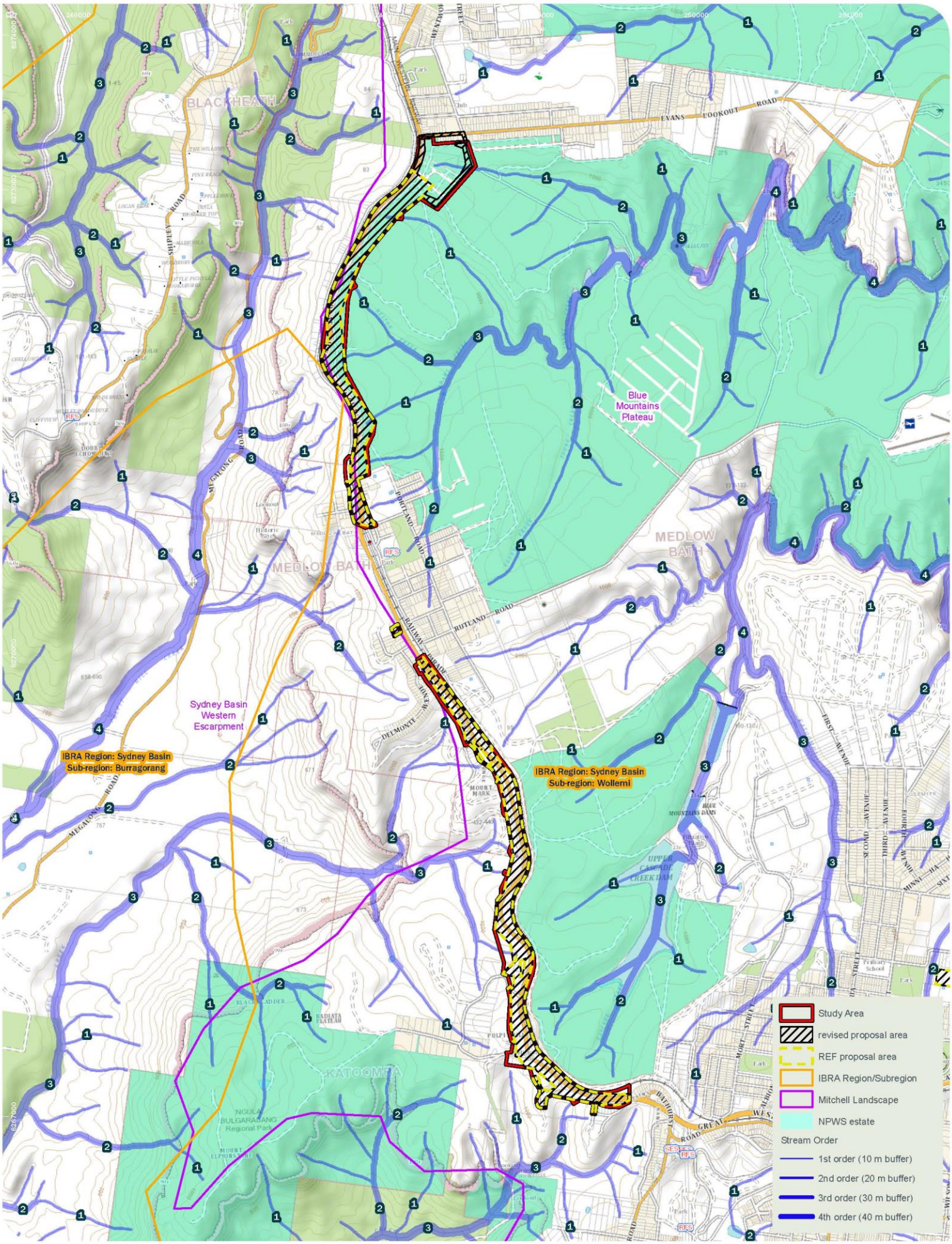
The ‘revised proposal area’ (July 2022) for the additional works contains areas proposed for ground disturbance (including construction and operation) and encompasses ancillary infrastructure elements as summarised in section 1.2 (Figure 1-1 and Figure 1-2).

The revised proposal area is about 3.48 hectares in size. It is an extension to the REF proposal area at the western end of the Medlow Bath to Blackheath section only. The revised proposal area involves the continuation of the active transport trail in the Medlow Bath to Blackheath section to Valley View Road, Blackheath. The revised design also includes maintenance access routes and ancillary utilities (high voltage electricity, optical fibres, and water mains).

Biodiversity investigations were conducted across the revised proposal area, which is also within the study area. The cleared area within the study area is about 15.12 hectares, comprising cleared land (such as the existing Great Western Highway and easement, and surrounding residential land, firetrails and existing infrastructure) as well as areas of non-native vegetation.

Native vegetation occupies about 68.80 hectares of the study area, which predominately consists of Plant Community Type (PCT) 1248, PCT 1078 and PCT 967 of varied conditions classes as discussed in section 3.

Native vegetation to the north, northeast, west and southwest of the proposal area is moderately to well connected to the proposal area and is part of a contiguous large patch (Blue Mountains National Park and WaterNSW lands). However, portions of the proposal area have been previously impacted by historical land clearing, residential and commercial development, and existing infrastructure which has slightly reduced the connectivity of portions of the proposal area. The design of the proposal and the implementation of relevant mitigation measures assist in preventing and/or minimising potential indirect impacts to ecologically sensitive areas such as Blue Mountains National Park and WaterNSW lands (Section 5).



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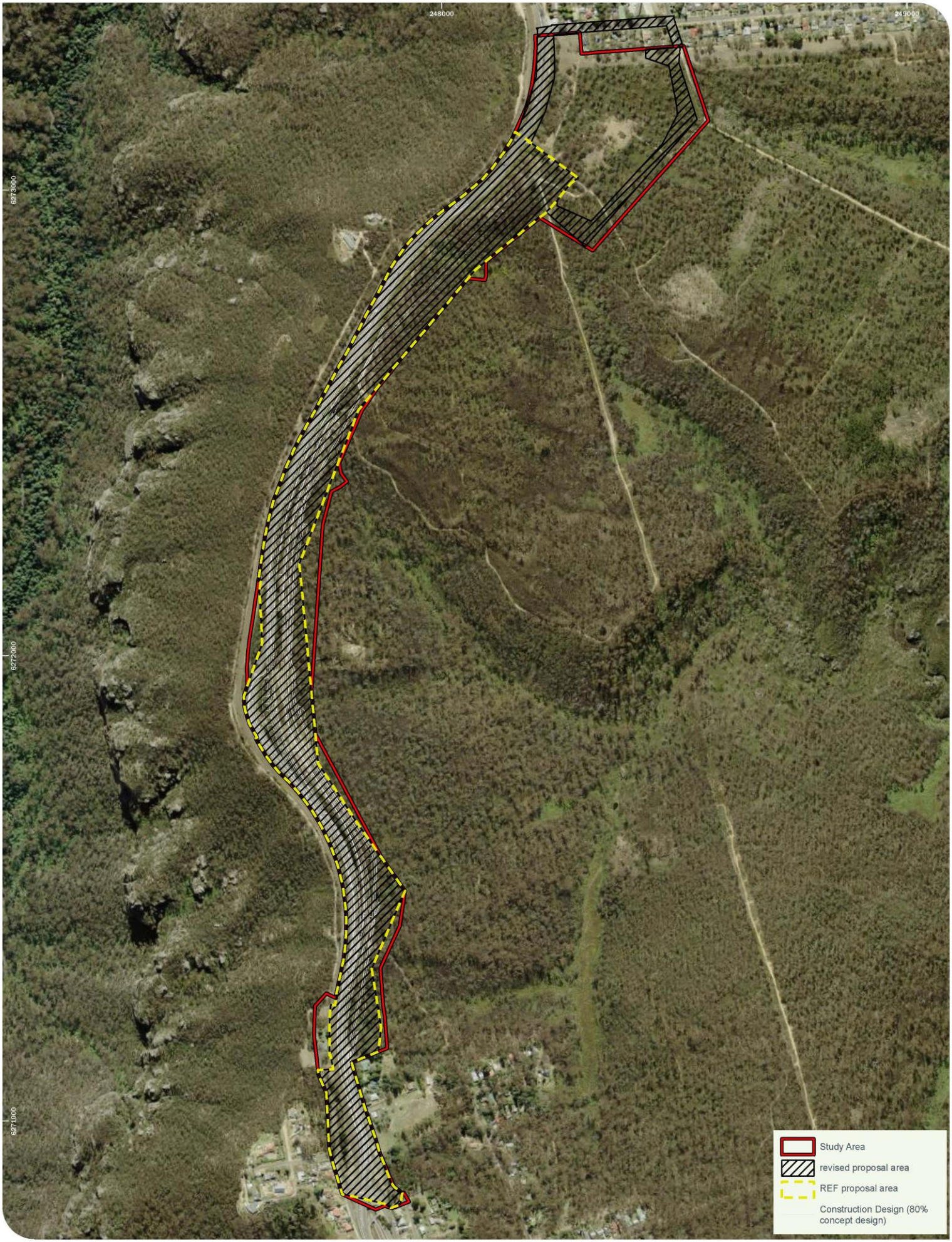
Client: Aurecon

Proposal context
Great Western Highway Upgrade - BAR

Figure 1-1



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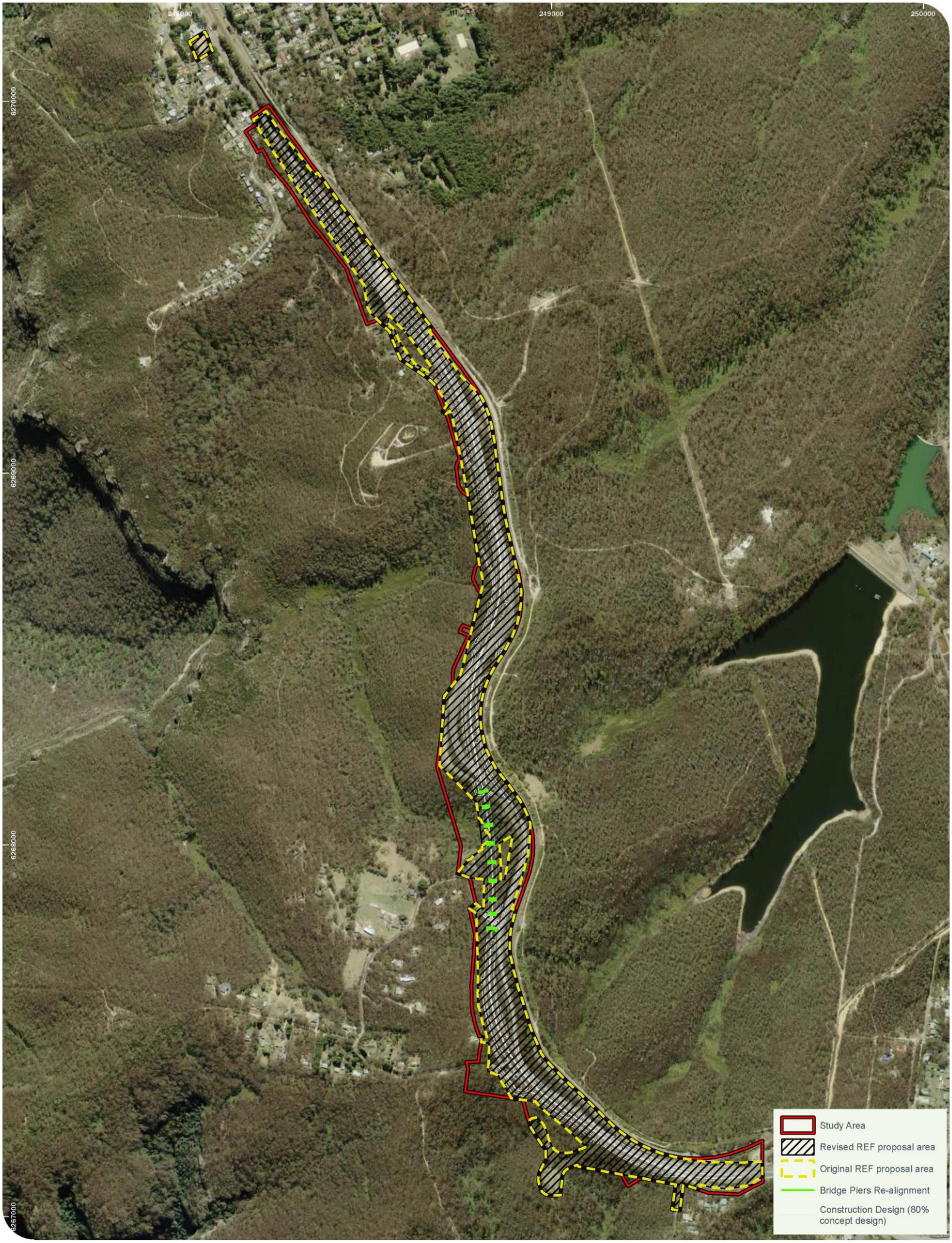
The Proposal
Great Western Highway Upgrade - BAR

Figure 1-2



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The Proposal

Great Western Highway Upgrade - BAR

Figure 1-2

1.4 Legislative context

A Review of Environmental Factors (REF) is being prepared to satisfy TfNSW's duties under s.5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity" and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the Great Western Highway Upgrade East and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

Sections 7.2 of the BC Act and Part 7A of the FM Act require that the significance of the impact on threatened species, and endangered ecological communities is assessed using a five-part test. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the BAM.

1.4.1 Biodiversity Conservation Act 2016 (BC Act)

The BC Act came into effect on the 25 August 2017. This Act repealed the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

The BC Act outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). The BOS creates a transparent, consistent, and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity.

The BOS is not mandatory for activities approved under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) although the determining authority must be satisfied that the proposed activity is unlikely to significantly affect threatened species in accordance with Section 7.3 of the BC Act.

This BAR considers the likely occurrence of threatened biodiversity listed under the BC Act within section 3, including further assessment of impacts (Five-part Tests of Significance) under the BC Act for those with the potential to occur or be impacted by the proposal (Annexure D). Avoidance and mitigation measures are described in Section 4 and 6.

1.4.2 Fisheries Management Act 1994 (FM Act)

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations to:

- Conserve fish stocks and key fish habitats
- Conserve threatened species, populations and ecological communities of fish and marine vegetation; and
- Promote ecologically sustainable development, including the conservation of biological diversity.

Protection is provided by integrating the conservation of threatened species, endangered populations and Endangered Ecological Communities (EECs) /Critically Endangered Ecological Communities (CEECs) into development control processes under the EP&A Act.

Part 7A Division 4 of the FM Act prohibits, without a licence or permit, activities that damage habitats or harm threatened species, populations or ecological communities.

The proposal will not impact any tributaries identified as 'Key Fish Habitat' (KFH) under the FM Act.

1.4.3 EPBC Act Assessment Requirements

Matters of National Environmental Significance (MNES) are protected under the EPBC Act. The BAM requires proponents to identify and assess the impacts on all nationally listed threatened species and

threatened ecological communities that may be present on or near the development site. Therefore, the BAM has partly been used to perform assessment of impacts under the EPBC Act.

In September 2015, a “strategic assessment” approval was granted by the Federal Minister in accordance with the EPBC Act. The approval applies to TfNSW activities being assessed under Division 5.1 of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species. Obligations arising from the approval have been incorporated into TfNSW environmental impact assessment procedures, guidelines and templates.

The practical effect of the approval is that TfNSW projects assessed via an REF:

- Must address and consider potential impacts on nationally listed threatened species, populations, ecological communities, and migratory species, including application of the “avoid, minimise, mitigate and offset” hierarchy.
- Do not require referral to the Federal Department of Agriculture, Water and the Environment (DAWE) for these matters, even if the activity is likely to have a significant impact.
- Must use the Biodiversity Offset Scheme (BOS) to offset project impacts.

Given the proposal is being undertaken by TfNSW under Division 5.1 of the EP&A Act, the strategic assessment applies. This BAR considers the likely occurrence of threatened biodiversity listed on the EPBC Act within section 3.12, including further assessment of impacts under the EPBC Act undertaken via assessments of significance for EPBC Act listed species with the potential to be affected by the proposal (Annexure E). Avoidance and mitigation measures are described in Section 6.

2 Methods

2.1 Personnel

This BAR was carried out by appropriately qualified and experienced environmental professionals, ecologists and accredited people as demonstrated in Table 2-1.

Table 2-1: Personnel

Name	Role	Qualifications
Dr Amanda Griffith Senior Associate - Ecology	Fauna field survey, project management, accredited assessor, and quality assurance	Bachelor of Science (Hons), PhD, Accredited BAM Assessor (BAAS19016)
Kayla McGregor Ecologist	Flora and fauna field surveys, assistant project management, data management and report preparation	Bachelor of Environmental Science (Hons1)
Isabel Lyons Ecologist	Flora and fauna field surveys, data management and report preparation	Bachelor of Science (Environmental Biology)
Sarah Hart Ecologist	Flora and fauna field surveys, and data management	Bachelor of Science, Master of Science, Graduate Diploma of Environmental Management
Stephen Bloomfield Senior Associate - Ecology	Flora surveys, accredited assessor, and quality assurance.	Bachelor of Applied Science (Coastal Management) Accredited BAM Assessor
Amy Legge **Ecologist**	Flora and fauna field surveys, and data management	Bachelor of Science (Conservation Biology)
Yin Hua GIS Consultant	Preparation of field and report maps, management of spatial databases, spatial analysis, and database searches	Bachelor of Environmental Science, Master of Science in Information Technology

2.2 Background research

A review of relevant literature, databases and existing vegetation mapping was undertaken to identify vegetation, threatened flora and fauna and Threatened Ecological Communities (TECs) that are listed under both NSW and Commonwealth legislation, with potential to occur within the study area.

Prior to the current assessment, Niche were engaged by TfNSW to conduct preliminary biodiversity surveys in Spring 2020 in relation to understanding biodiversity constraints/values within the Great Western Highway Upgrade Program corridor (from Katoomba to Lithgow). Results of the preliminary investigations were reviewed prior to the field survey to inform field survey requirements for the current assessment.

A likelihood of occurrence analysis (Annexure B) was then undertaken for each species/TEC, based on suitability of habitat present within the study area. Species with a moderate or higher likelihood of occurrence or identified by the BAM-C as candidate species were identified as subject species.

The following databases/resources were used for this purpose:

- Great Western Highway Upgrade - Katoomba to Lithgow: Preliminary Biodiversity Survey - Report 1 - Proposed Tunnel Portal Locations (Niche 2021a)
- Great Western Highway Upgrade - Katoomba to Lithgow: Preliminary Biodiversity Survey - NPWS revocation area – Medlow Bath to Blackheath (Niche 2021b)
- Great Western Highway Upgrade - Katoomba to Lithgow: Preliminary Biodiversity Survey - Report 3 – Additional areas (Niche 2021c)
- Department of Planning, Infrastructure, and the Environment (DPIE) BioNet, Atlas of NSW Wildlife (DPIE 2019b)
- Department of Agriculture, Water and Environment (DAWE) EPBC Act Protected Matters Search Tool (DoEE 2019a)
- Threatened Biodiversity Data Collection (TBDC) (DPIE 2021a)
- Directory of Important Wetlands of Australia (DIWA) published by Environment Australia: http://www.environment.gov.au/cgi-bin/wetlands/search.pl?smode=DOIW
- The federal Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE) (Bureau of Meteorology 2021b)
- Species Profile and Threats (SPRAT) database for EPBC listed threatened species and communities: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- Biodiversity Assessment Method Calculator (BAM-C) for prescribed and candidate threatened biodiversity.

A total of 129 threatened entities (Annexure B) were considered in the assessment.

2.3 Habitat assessment

The habitat-based field survey included sufficient effort to determine the presence of habitat within the study area, for the subject threatened flora and fauna predicted by the BAM-C or considered likely to occur based on presence of database records (Annexure B).

As per the Biodiversity Assessment Method (BAM, DPIE 2020a), each of the subject threatened fauna identified by the BAM-C must be addressed. The threatened fauna species predicted or potentially occurring within the IBRA subregion as generated by the BAM-C were reviewed and refined post field survey on the basis of the vegetation types, condition, and habitat features, as well as the results of field survey.

In accordance with Section 6.4 of the BAM the threatened fauna list of potentially occurring species may be further refined where:

- habitat constraints listed for the species in the TBDC are absent from the study area (or particular vegetation zones), or
- habitat constraints or microhabitats on which the species depends are sufficiently degraded such that the species is unlikely to use the study area, or
- the species is vagrant in the IBRA subregion, or
- an expert report is prepared (in accordance with Subsection 6.5.2 of the BAM) stating that the species is unlikely to be present on the study area.

The likelihood of occurrence for threatened flora and fauna, along with the candidate species as per the BAM-C dictated the survey method approach.

2.4 Field survey

A number of field campaigns were undertaken within the study area by Niche ecologists over multiple seasons; Spring/ Summer 2020 (14 October - 17 December 2020), Winter 2021 (15 - 20 June 2021), Spring 2021 (13 - 18 September 2021), Summer 2021 (6 - 11 December 2021), Autumn 2022 (11 March 2022) and Winter 2022 (29 July 2022, and 3 – 5 August 2022). Surveys were conducted in accordance with the BAM wherever possible to allow for compliance and reporting under the BOS if required. The following assessments were undertaken and are detailed further below:

- Floristic and BAM plots to determine Plant Community Type (PCT) and condition (section 2.4.1)
- Habitat mapping (hollow-bearing tree survey, watercourses, rocky outcrops, fallen woody debris and ground refugia, feed trees, nests etc.) (section 2.3)
- Spotlighting for nocturnal mammals and birds (Winter 2021, Spring 2021, Winter 2022) (section 2.4.4)
- Stagwatching (hollow watching) for nesting Glossy Black-Cockatoos (Spring 2021, Summer 2021) (section 2.4.4)
- Terrestrial baited camera trapping (Spring 2020, Summer 2021/2022) (section 2.4.4)
- Anabat deployment and analysis (Spring 2020, Summer 2021) (section 2.4.4)
- Dry pitfall trapping for Blue Mountains Water Skink (*Eulamprus leuraensis)* (Summer 2021) (section 2.4.4)
- Giant Dragonfly (*Petalura gigantea)* transects (Summer 2021) (section 2.4.4)
- Opportunistic fauna observations (all surveys)
- Targeted survey for threatened plants (section 2.4.3).

2.4.1 Vegetation surveys

Prior to field surveys, the study area was stratified using aerial photographic interpretation (API), and existing vegetation mapping projects, such as the Blue Mountains Mapping Project (DPIE 2002). Following a review of the existing mapping, field surveys were carried out on 15 to 20 June 2021, to stratify the vegetation as per the BAM (including areas within the revised proposal area).

Plant Community Types (PCTs) and condition classes (vegetation zones) across the study area were recorded and mapped using floristic data collected from BAM plots and Rapid Data Points (RDPs). Vegetation mapped as occurring within the study area is shown on Figure 2-1 along with the location of the completed BAM plots. In total, 14 BAM plots were completed within the study area to meet the minimum plot requirement as per the BAM (Table 2-2 and Figure 2-1). Random meanders across the study area were completed to assist in vegetation zone delineation and the vegetation mapping validation.

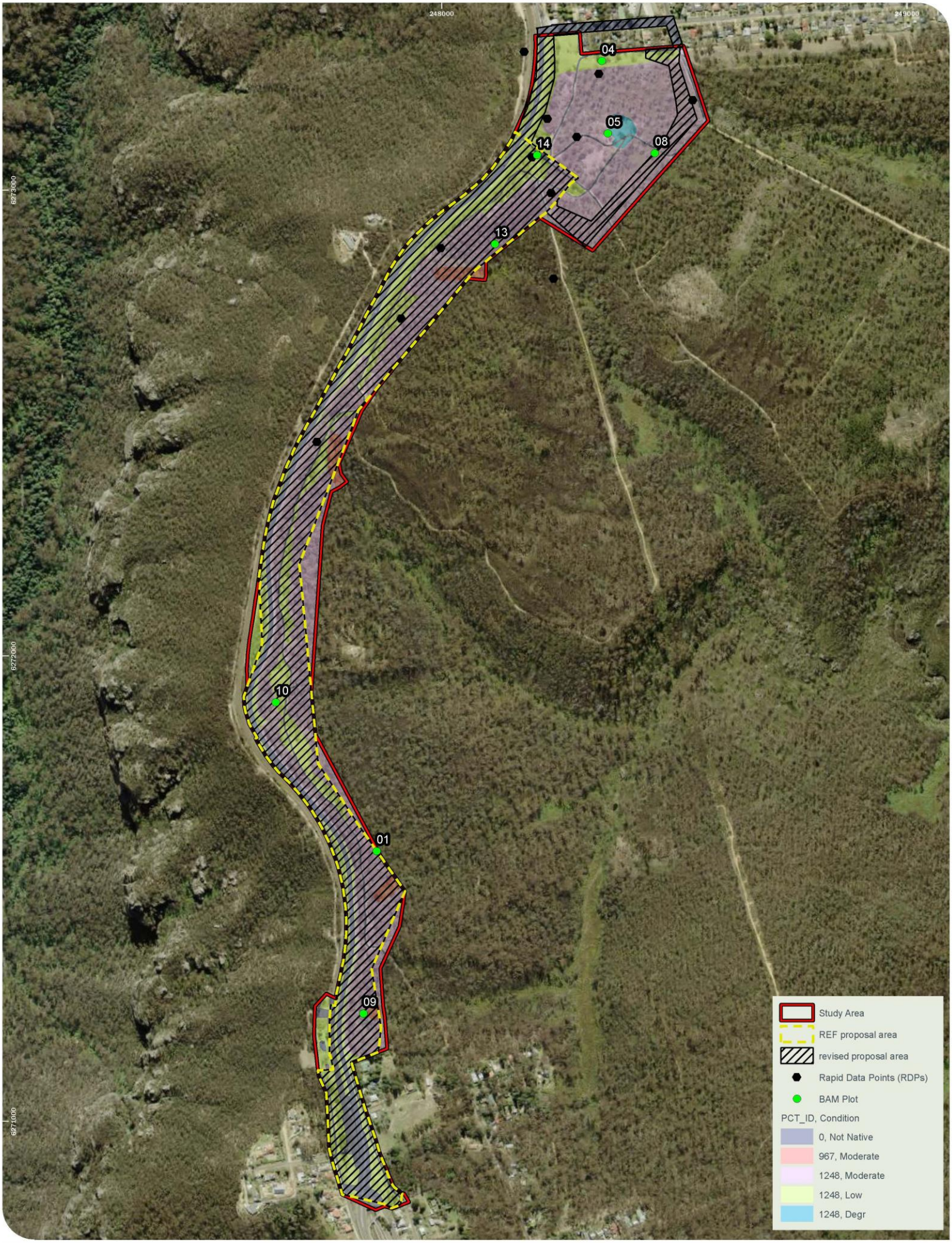
Alignment of the vegetation communities to a PCT is discussed in detail in section 3.3 below. The number of plots conducted for each PCT, and vegetation zone is provided in Table 2-2. A summary of the vegetation zones presents including their vegetation formation, class and status is provided in Table 2-3.

Table 2-2: Minimum number of plots required per zone area

Vegetation zone	Vegetation zone within the study area (ha)	BAM plot requirement	Number of plots completed
1248_Moderate	43.33	4	5
1248_Low	23.50	4	5
1248_Degraded	0.30	1	1
967_Moderate	0.90	1	1
967_Low	0.06	1	1
1078_Moderate	0.71	1	1
Total	**68.80**	**12**	**14**

Table 2-3: Plant community types by vegetation zone

Vegetation Zone	Plant Community Type (PCT)	Vegetation Formation	Vegetation Class	Threatened Ecological Community	PCT Cleared Extent	Condition identified (Used in BAM-C)	Vegetation integrity score	Area within the study area (ha)	Area within REF proposal area (ha)	Area within the Revised proposal area (ha)	Additional hectares
PCT 1248 - Moderate	1248 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Montane Dry Sclerophyll Forests	Does not align to any TEC	20	Moderate	59.1	43.33	27.74	29.32	1.63
PCT 1248 - Low	1248 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Montane Dry Sclerophyll Forests	Does not align to any TEC	20	Low	41.6	23.50	19.06	19.88	0.82
PCT 1248 - Degraded	1248 Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Montane Dry Sclerophyll Forests	Does not align to any TEC	20	Degraded	5.1	0.30	0	0	0
PCT 967 - Moderate	967 Narrow-leaved Peppermint - Silvertop Ash - Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Montane Dry Sclerophyll Forests	Does not align to any TEC	5	Moderate	47.1	0.90	0.70	0.70	0
PCT 967 - Low	967 Narrow-leaved Peppermint - Silvertop Ash - Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Montane Dry Sclerophyll Forests	Does not align to any TEC	5	Low	24.1	0.06	0.06	0.06	0
PCT 1078 - Moderate	1078 - Prickly Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Montane Dry Sclerophyll Forests	Aligns to a TEC		Moderate	44.5	0.71	0	0	0
Total native vegetation								**68.80**	**47.56**	**50.01**	**2.45**
Non-native	Non-native	-	-	-	-	-	-	15.12	13.34	14.32	0.97
Total area								**83.92**	**60.90**	**64.34**	**3.42**



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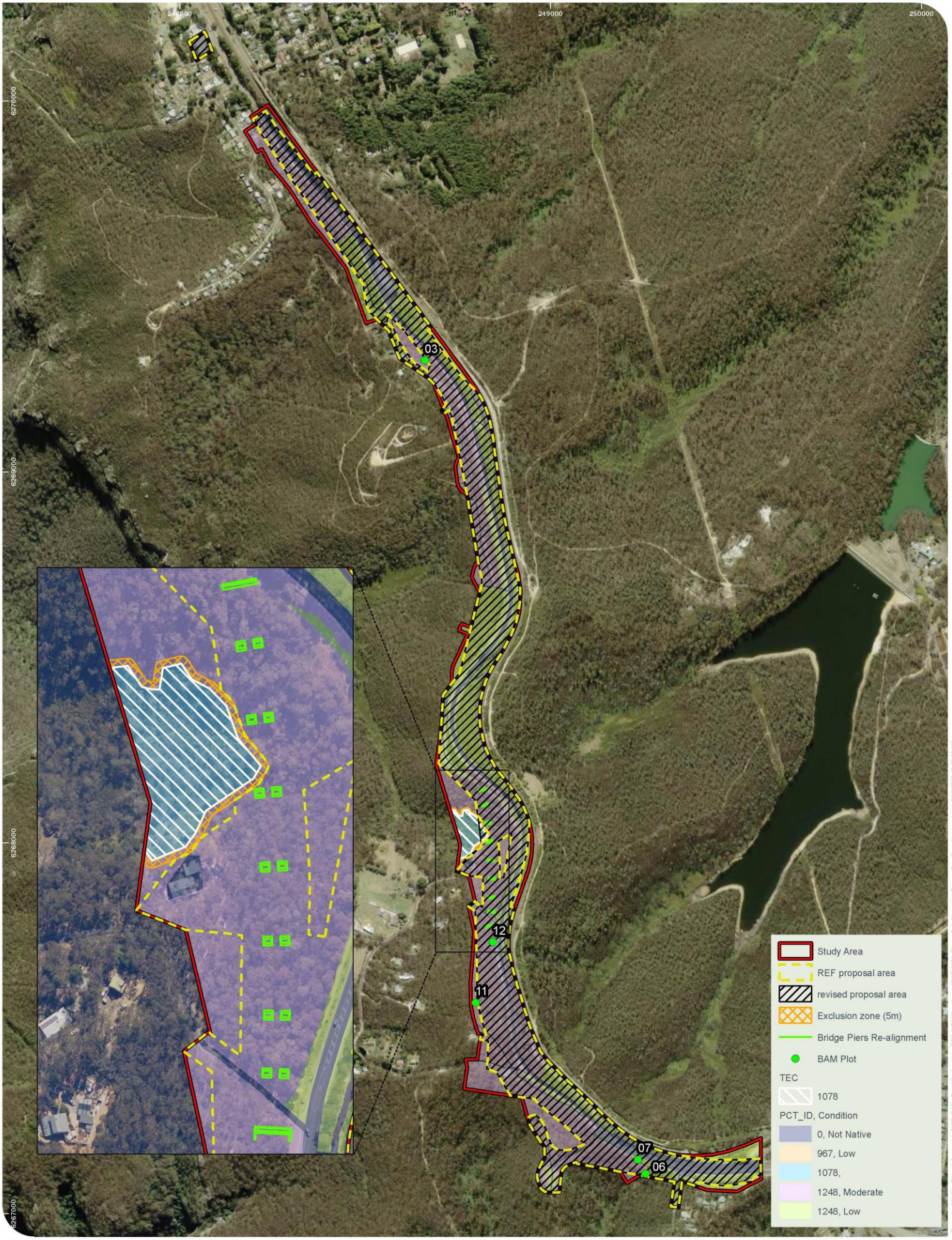
Vegetation survey locations
Great Western Highway Upgrade - BAR

Figure 2-1



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Vegetation survey locations
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Figure 2-1

2.4.3 Targeted flora surveys

A total of 38 threatened flora species were considered as potential subject species (Annexure B Habitat assessment table). These species were identified through the database searches as having a moderate to high likelihood of occurrence or as generated by the BAM-C.

In total, about 104 hours within the REF proposal area, and 18 hours within the revised proposal area, of targeted flora survey were conducted (122 person hours in total). This included 12 person hours during October 2020 Spring surveys, around 40 person hours during June 2021 Winter surveys,44 person hours during Spring 2021, eight person hours during March 2022 Autumn surveys and 18 person hours in July/August 2022 Winter Surveys (Table 2-4The vegetation was relatively dense in sections resulting in some observer obstruction during the transects walks. To accommodate the reduced observability, the average walking pace of the observer was reduced to less than 1.5 kilometres per hour within dense sections.

Table 2-4: Targeted threatened flora survey details

Species	Minimum survey requirements	Survey completed
October to December 2020 Surveys (14 species): • Silver-leaved Gum *(Eucalyptus pulverulenta)* • Needle Geebung *(Persoonia acerosa)* • Cotoneaster Pomaderris *(Pomaderris cotoneaster)* • Wollemi Mint-bush *(Prostanthera cryptandroides subsp. cryptandroides)* • Buttercup Doubletail *(Diuris aequalis)* • Deane's Boronia *(Boronia deanei)* • Klaphake's Sedge *(Carex klaphakei)* • Fletcher's Drumstick *(Isopogon fletcheri)* • Cambage Kunzea *(Kunzea cambagei)* • Slaty Leek Orchid *(Prasophyllum fuscum)* • Smooth Bush-Pea *(Pultenaea glabra)* • *Velleia perfoliata* • *Verionica blakelyi* • *Xanthosia scopulicola.*	In accordance with Section 4.3 of the Threatened Flora Survey Guidelines (DPIE 2020b), the minimum survey effort required for 25 ha of suitable habitat is 33.33 person hours, with 5 metres parallel traverses.	Parallel traverses (5 m apart across the entire study area) were conducted. About 12 person hours of targeted threatened flora searches (by two ecologists) was undertaken across the study area. Given the lack of certainty around the final proposal footprint at that stage, additional targeted surveys were required within previously unsurveyed areas in accordance with Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (DPIE 2020a) (as below). Surveys were undertaken during suitable climatic conditions.

Species	Minimum survey requirements	Survey completed
June 2021 Surveys (10 species): • Needle Geebung *(Persoonia acerosa)* • *Zieria involucrata* • *Acrophyllum australe* • *Eucalyptus copulans* • Narrow-leaf Finger Fern *(Grammitis stenophylla)* • *Persoonia hindii* • *Acacia gordonii* • *Darwinia peduncularis* • Evans Grevillea *(Grevillea evansiana)* • Hairy Geebung *(Persoonia hirsuta)*	In accordance with Section 4.3 of the Threatened Flora Survey Guidelines (DPIE 2020b), the minimum survey effort required for 25 ha of suitable habitat is 33.33 person hours, with 5 metres parallel traverses.	Parallel traverses (5 m apart across the entire study area) were conducted. About 40 hours of targeted threatened flora searches (by two ecologists) was undertaken across the study area. Survey effort adequately meets the minimum survey requirements outlined in the guidelines (DPIE 2020) given the area of suitable habitat was determined to be 22.6 ha.
September 2021 surveys (three species): • Needle Geebung *(Persoonia acerosa)* • Thick-leaf Star-hair *(Astrotricha crassifolia)* • Narrow-leaf Finger Fern *(Grammitis stenophylla)*	In accordance with Section 4.3 of the Threatened Flora Survey Guidelines (DPIE 2020b), the minimum survey effort required for 25 ha of suitable habitat is 33.33 person hours, with 5 metres parallel traverses.	Parallel traverses (5 m apart) across the REF proposal area were conducted. About 44 person hours of targeted threatened flora searches (by two ecologists) was undertaken.
March 2022 surveys (one species): • Superb Midge Orchid *(Genoplesium superbum)*	In accordance with Section 4.3 of the Threatened Flora Survey Guidelines (DPIE 2020b), the minimum survey effort required for 1 ha of PCT 967 and associated ecotones (approximately 2.5 ha in total), is 3.5 person hours, with 5 metres parallel traverses.	Parallel traverses (5 m apart) in areas of PCT 967, and the adjacent ecotonal areas, were conducted. About 8 person hours of targeted threatened flora searches (by two ecologists) was undertaken within PCT 967 and immediate surrounds.
July 2022 Winter Surveys (three species in the revised proposal area): • Needle Geebung (*Persoonia acerosa*) • Hairy Geebung (*Persoonia hirsuta*) • Bynoe's Wattle (*Acacia bynoeana*)	In accordance with Section 4.3 of the Threatened Flora Survey Guidelines (DPIE 2020b), the minimum survey effort required for 3.48 hectares of suitable habitat is 5.34 person-hours, with five metres between parallel traverses.	Parallel traverses (5 m apart) across the revised proposal area was conducted. About nine person hours of targeted threatened flora searches (by two ecologists) was undertaken within PCT 1248 and immediate surrounds.
August 2022 Winter Surveys (three species in the revised proposal area): • Thick-leaf Star-hair *(Astrotricha crassifolia)* • Woronora Beard-heath *(Leucopogon exolasius)* • Flockton Wattle *(Acacia flocktoniae)*	In accordance with Section 4.3 of the Threatened Flora Survey Guidelines (DPIE 2020b), the minimum survey effort required for 3.48 hectares of suitable habitat is 5.34 person-hours, with five metres between parallel traverses.	Parallel traverses (5 m apart) across the revised proposal area were conducted. About nine person hours of targeted threatened flora searches (by two ecologists) was undertaken within PCT 1248 and immediate surrounds.

2.4.4 Targeted fauna surveys

The field survey included sufficient effort to determine the presence of habitat within the study area, for the subject threatened fauna predicted by the BAM-C or considered likely to occur (Annexure B).

As per the BAM, each of the subject threatened fauna identified by the BAM-C must be addressed. The threatened fauna species predicted or potentially occurring within the IBRA subregion as generated by the BAM-C were reviewed and refined post field survey on the basis of the vegetation types, condition and habitat features, as well as the results of field survey.

In accordance with Section 6.4 of the BAM the threatened fauna list of potentially occurring species may be further refined where:

- habitat constraints listed for the species in the TBDC are absent from the study area (or particular vegetation zones), or
- habitat constraints or microhabitats on which the species depends are sufficiently degraded such that the species is unlikely to use the study area, or
- the species is vagrant in the IBRA subregion, or
- an expert report is prepared (in accordance with Subsection 6.5.2 of the BAM) stating that the species is unlikely to be present on the study area.

The likelihood of occurrence for threatened fauna, along with the candidate threatened fauna as per the BAM-C dictated the survey method approach.

The database analysis and BAM-C output determined the potential for 56 threatened fauna species to occur or have potential habitat within the locality (Annexure C).

The fauna survey was designed to detect potentially occurring threatened species and allow for an inventory of species to be compiled for the study area. Primarily, the field survey program was designed to target threatened fauna that are regarded as ‘species credit’ fauna, and those listed as threatened on the EPBC Act. Details regarding the survey effort undertaken are provided in Table 2-5.

Fauna survey effort across the study area is shown in Figure 2-2. In summary, it included:

- Searches for habitat features identified as habitat constraints in the BAM for species with the potential to occur (such hollow-bearing trees and stick nests for large birds of prey, forest owls, large parrots and arboreal fauna and cliff lines/karst for cave-dwelling microbats)
- Survey for microbats using remote ultrasonic call detection devices (Anabat and Songmeters)
- Survey for ground-dwelling mammals (Eastern Pygmy-possum and Spotted-tailed Quoll) using baited camera traps (within the REF proposal area only)
- Surveys for nocturnal arboreal and terrestrial fauna (spotlighting and aural surveys)
- Dusk stagwatching of potential nest hollows suitable for threatened Cockatoos (Glossy Black-Cockatoo and Gang-gang Cockatoo) (within the REF proposal area only)
- Dry pitfall trapping in Upland Swamp habitat for Blue Mountains Water Skink
- Targeted transects in Upland Swamp habitat (parallel transects 5-metres apart) for Giant Dragonfly.

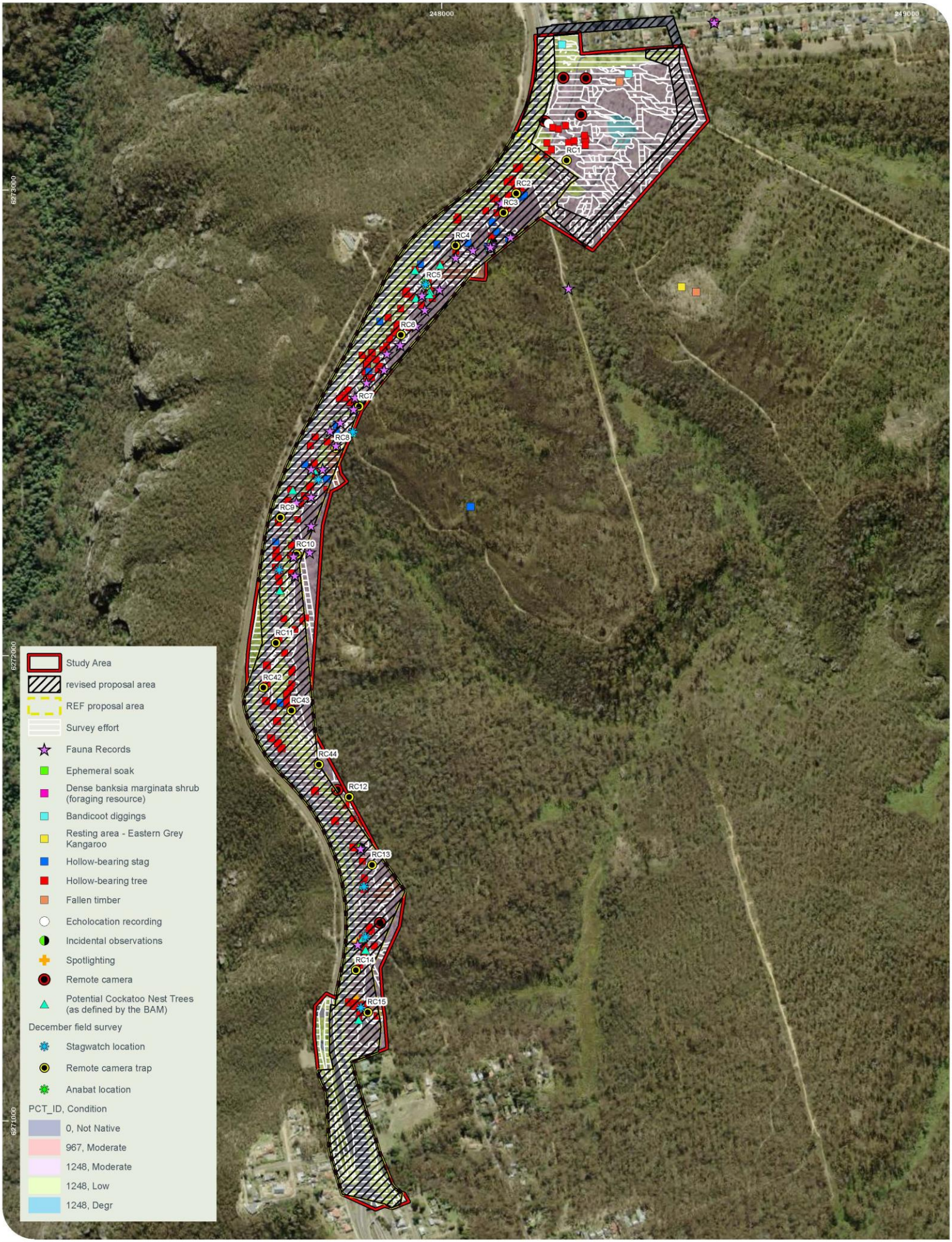
Table 2-5: Targeted threatened fauna survey details

Species	Minimum survey requirements	Survey completed
Arboreal mammals and owls – habitat assessment and nocturnal survey	Spotlighting on foot 2 x 1-hour and1km up to 200 ha of stratification unit, walking at approximately 1km per hour on 2 separate nights arboreal and terrestrial mammals (DEC 2004a). Survey effort on foot will involve at least two searches, each for one hour with a hand-held spotlight of appropriate power for the conditions. This must be conducted on each of two separate nights along a traverse of at least 1 km, which samples the least disturbed parts within the stratification unit. Where the stratification unit is too small to achieve a 1 km traverse, a proportionate amount of spotlighting must be done. This must be repeated at least once on a separate night. Foot spotlight traverses must involve two observers, each using spotlights. Weather and moonlight conditions should be considered as these can affect survey results (DEC 2004a).	**Habitat assessments** in accordance with the BAM 2020 were undertaken during preliminary surveys (14 October to 17 December 2020; around 10 person hours), between 15 to 20 June 2021 across the REF proposal area (between 3.5 to 4 hours per day, approximate survey effort of > 20 person hours), and 29 July 2022 across the revised proposal area (approximately survey effort of 10 person hours), to determine the presence of suitable habitat for threatened species previously recorded or predicted to occur within the site. **Spotlighting** was undertaken in each accessible portion of the study area, by two observers over four trap nights in Winter 2021 (16 to 19 June 2021), and Winter 2022 (3 to 5 October 2022). The study area was separated into four main stratification units: • Katoomba to Explorers Road (1 kilometre) • Foy Avenue to Delmonte Avenue, Medlow Bath (1 kilometre) • Medlow Bath to Evans Lookout Road (2 kilometres) • Tennyson Road, Blackheath to Evans Lookout Road, Blackheath (1 kilometre). The survey effort across the four nights equated to 16 person hours. The survey effort was adequate to address the minimum requirement of the survey guidelines. However, the four nights of survey were undertaken in sub-optimal conditions (very cold and wet) which potentially affected activity/detectability of the target species (see section 2.5). In lieu of the poor climatic conditions in June 2021, additional nocturnal surveys were conducted in early September 2021 (13 to 17 September 2021). Climatic conditions during nocturnal surveys in September 2021 and August 2022 weren't considered optimal, however, they were improved (calm, reduced cloud cover, and an increase in daily temperature). The survey effort across this period equated to 52 person hours. The survey effort was adequate to address the minimum requirement of the survey guidelines.
Giant Dragonfly - targeted transects in Upland Swamp habitat (5-metres apart)	According to TBDC (2021), Giant Dragonfly requires surveying within swamp habitat. Distances that the species disperses to breed are dependent on the elevation of the terrain around the swamp and are more likely to disperse further if the terrain surrounding the swamps is flat (low elevation). Drawing on the methodology used by Baird (2012), systematic 'Pollard' transects were undertaken (5-metre parallel transects, typically used to survey flying invertebrates) to record the following: • flying adults	During Summer 2021 surveys (7 and 10 December 2021), two rounds of targeted parallel transect were undertaken by two observers across Upland Swamp habitat. The survey effort across the two surveys, with two observers, equated to 9.4 person hours. Transects were undertaken through swamp habitat, within areas of abundant sedges, underlain by peaty bogs. Observers were looking for signs of flying adults, potential burrows, and larval exuviae. The survey effort was adequate to address the minimum survey requirements. However, there are many knowledge gaps relating to emergence patterns of this species. Limitations of the survey are outlined in Section 2.5.

Species	Minimum survey requirements	Survey completed
	• burrows in the substrate of peaty bogs • larval exuviae (the dried larval "skins" left clinging to vegetation after the adult dragonfly has emerged) • substrate type (ideally, this should be peaty and somewhat moist).	
Blue Mountains Water Skink - Dry pitfall trapping	Appropriate survey methodology for detecting the presence of the Blue Mountains Water Skink is targeted diurnal pitfall trapping between the months of December to February when the species is most likely to be active, using a line of three 10 litre buckets each approximately 5 metres apart (although other pitfall trap arrays could be trialled). No drift fence is required (DAWE 2011b).	During Summer 2021 surveys (6 to 10 December 2021), two trap lines of three 10 litre buckets each approximately 5 metres apart were deployed in the Upland Swamp area within the study area (Figure 2-2). Traps were lined with dry leaf litter/woody debris for protection and shading of captured animals and wood as floatation device if traps were to be potentially inundated (if heavy rainfall was likely traps were to be closed). Traps were opened in the morning and checked and closed in the late afternoon. Reptiles and amphibians were then identified, recorded, and released. The six traps (two trap lines) were deployed for five days (diurnally), for a total 265 trapping hours. The survey effort was adequate to address the minimum survey requirements. Limitations of the survey are outlined in Section 2.5.
Glossy Black-cockatoo and Gang-gang Cockatoo - - Stagwatching	**Dusk assessment (stagwatching) targeting potential Glossy Black-Cockatoo nesting habitat (January to September):** Glossy Black-cockatoo are most active during the first or last two hours of daylight (Glossy Black Conservancy 2010), so surveys should encompass a dawn OR dusk period. Stagwatching (suitable nest trees; hollows greater than 8 m above ground and greater than 15 cm) should be conducted 30 min before dusk until 60 min after sunset (DEC 2004). **Dusk assessment (stagwatching) targeting potential Gang-gang Cockatoo nesting habitat (October to January):**	**Glossy Black-Cockatoo**: During Spring 2021 (13 - 18 September 2021) surveys, dusk stagwatching was undertaken over four nights across the REF proposal area, targeting potential nest trees. Surveys commenced an hour before dusk, to target any individuals returning to nest sites. The survey effort across the four surveys, with two observers, targeting nine potential nest trees equated to 13.36 person hours. **Gang-gang Cockatoo**: During Summer 2021 (6 – 10 December 2021) surveys, dusk stagwatching was undertaken over four nights across the REF proposal area, targeting potential nest trees. Surveys commenced an hour before dusk, to target any individuals returning to nest sites. The survey effort across the four surveys, with two observers, targeting 13 trees equated to 14 person hours.

Species	Minimum survey requirements	Survey completed
	Stagwatching (suitable nest trees; hollows greater than 9 cm) should be conducted 30 min before dusk until 60 min after sunset (DEC 2004). Given that bird activity is typically highest 1 hour before dusk or within 1 hour at dawn, surveys will be within one hour prior to dusk to target any individuals returning to nest sites.	The survey effort for both cockatoo species was adequate to address the minimum survey requirements.
Threatened Microbats - Acoustic detection	In accordance with the 'Species credit' threatened bats and their habitats BAM survey guidelines (OEH 2018b), only the potential habitat of the target species within the subject land needs to be surveyed. To identify potential habitat, the surveyor will need to consider the subject land in relation to bat habitats. The BAM requires the subject land to be divided into relatively homogenous vegetation zones based on plant community types (PCTs) and condition. The potential habitat for any species credit bat species may be related to one or a group of PCTs and/or a combination of PCTs and specific niches such as rocky outcrops.	During Spring 2020 surveys, three songmeters were deployed within the study area: 2 in the north and 1 in the south. The northernmost songmeter was damaged by rain and the data lost. The songmeters were set to record from dusk to dawn. The songmeter within the M2B proposal area was in situ for 27 detector nights. The songmeter in the south of the proposal area was in situ for 19 detector nights. During Summer 2021 surveys, two songmeters were deployed within the study area: one in a gully in the south-west portion, and one in the north-east portion of the study area. Both songmeters were set to record from dusk to dawn. The songmeters were in situ for 5 detector nights each (10 detector nights in total). The devices were deployed in microhabitat that was deemed suitable for threatened microbat species (i.e., along vegetated corridors [flyways], adjacent to areas with topographic relief etc.). The loss of data from the water-damaged songmeter in Spring 2020, is not considered a limitation to survey effort, based on the results returned (see section 3.2**Error! Reference source not found.** for details). The combined survey effort for Spring 2020 and Summer 2021, equals 56 trap nights. The survey effort was adequate to address the minimum survey requirements.
Eastern Pygmy-possum and Spotted-tailed Quoll - Camera trapping (Also see above for spotlighting surveys undertaken)	According to Section 3.3.6 of the Survey guidelines for Australia's threatened mammals (DAWE 2011a), around 10 cameras per hectare should be deployed for a minimum of 14 nights (140 trap nights per hectare). Camera traps should not be used as the only survey method and should always be used in conjunction with other standard survey techniques (for example, spotlighting, hair tubes, Elliot traps, cage traps etc). Survey Period – October-March.	**Habitat assessments** in accordance with the BAM 2020 were undertaken during preliminary surveys (14 to 17 December 2020; around 10 person hours) and between 15 to 20 June 2021 across the entire study area (between 3.5 to 4 hours per day, approximate survey effort of > 20 person hours) to determine the presence of suitable habitat for threatened species previously recorded or predicted to occur within the site. **Spotlighting**. See above for spotlighting surveys; namely four trap nights of spotlighting conducted on three separate occasions in Winter 2021, Spring 2021 and Winter 2022. **Camera trapping.** During the preliminary field investigation (Spring/Summer 2020) three baited cameras were deployed at three different sites to target terrestrial mammal species including the Eastern Pygmy-possum (*Cercartetus nanus*) and Spotted-tailed Quoll (*Dasyurus*

Species	Minimum survey requirements	Survey completed
		maculatus). Baited remote cameras are commonly used to detect small mammals (Nelson *et al* 2009). Cameras were deployed terrestrially in areas determined as good quality habitat (i.e. abundance of feed tree species, nearby tree-hollows, dense ground cover, fallen logs and other refugia). Cameras were deployed for a minimum 87 traps nights within the M2B study area. Targeted surveys for the Eastern Pygmy-possum were conducted over summer 2021/2022 (6 December 2021 to 11 January 2022). 45 camera traps were deployed across the REF proposal area in line with approved advice from DPIE recognised 'species experts' Martin Schulz and Kylie Madden. Baited camera traps were set 100-200 metres apart in suitable habitat for a minimum of 33 nights, with half on the ground and half low in Banksias and other subcanopy species. Cameras were deployed for a total of 1,570 traps nights. The combined survey effort for Spring 2020 and Summer 2021/2022, equals 1,657 trap nights. Within the study area directly adjacent to the revised proposal area, there were five remote cameras deployed (four were deployed during the preliminary field investigation, and one during the Spring/Summer 2020 field investigation), the survey effort equals 179 trap nights. Additional camera deployment would be required in the revised proposal area to target terrestrial mammal species.



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Threatened species survey locations
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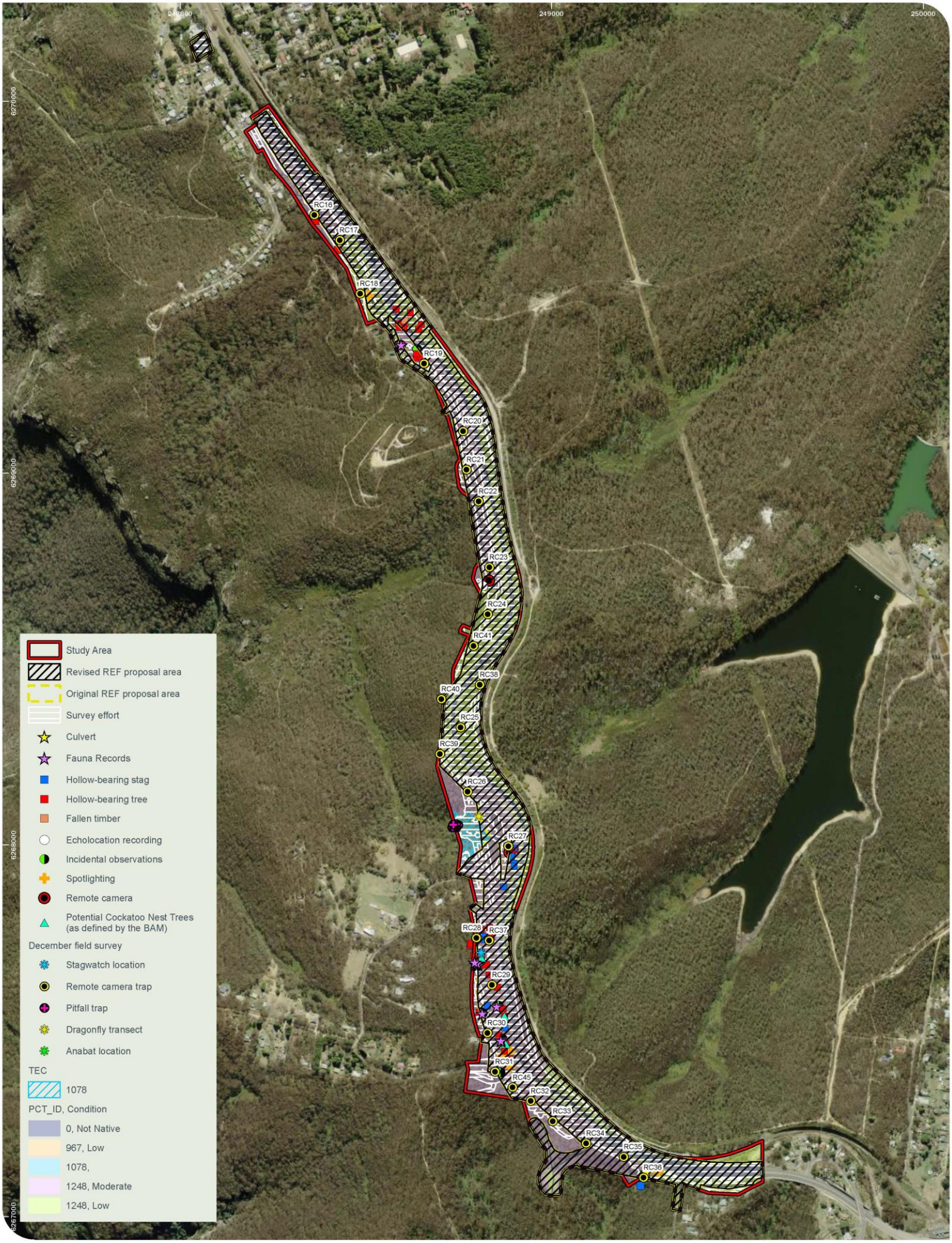
Figure 2-2



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Threatened species survey locations

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Figure 2-2

2.4.5 Aquatic Surveys

During the habitat assessment, aquatic habitats were confirmed absent from the REF proposal area and the revised proposal area and therefore, no further consideration was required.

2.5 Summary limitations

2.5.1.1.1 General assessment limitations

Numerous plant and animal species are cryptic or difficult to detect. Some cryptic plant species are more easily detected at certain times of the year, such as during flowering events. Some fauna species can only be detected during certain seasons (e.g., migration patterns or intra-torpor periods). These limitations were addressed by conducting surveys over a range of seasonal and climatic conditions to maximise seasonal coverage of survey effort and species detectability. This was also coupled with thorough analysis of species' specific habitat requirements and employing a range of trapping and survey techniques. All surveys have been undertaken in line with requirements of relevant State or Commonwealth guidelines (such as the BAM, DPIE 2020d) across the entire study area.

2.5.1.1.2 Acoustic bat surveys

Acoustic bat survey was undertaken during the preliminary surveys (Niche 2021 a, b, c). The acoustic survey was undertaken within the recommended survey period for threatened microbat species (October to March; DPIE 2018) and during favourable climatic conditions (daily average temperature of 22°C). Three locations along the study area were sampled: two in the north and one in the south. The northern-most songmeter did not capture any data due to damage from rain. As such, the survey effort across the study area is not considered sufficient to meet the guidelines. Despite this, a relatively large number of microbats, including threatened species were recorded. All but one of the Species Credit Species identified by the BAM-C and species considered likely to occur were recorded (Annexure B). The one species not recorded but considered likely to occur was the Large-eared Pied Bat (*Chalinolobus dwyeri*). This species is a Species Credit Species that utilises caves, mines, karst, and rocky overhangs for roosting/breeding. There are no rocky escarpment/caves/overhangs within the study area; the nearest suitable roosting habitat (clifflines) to the study area being about 370 metres away. However, the BAM survey guidelines for Species Credit bat species (OEH 2018b) require the preparation of Species Polygons (and associated offsetting) for "*All breeding habitat on or within 100m of the subject land and the area immediately surrounding the feature*" and also "*All habitat on the subject land where the subject land is within 2 kilometres of caves, scarps, cliffs, rock overhangs and disused mines*". As mentioned above, there is no potential roosting/breeding habitat within the study area. However, the study area is located within two kilometres of potential roosting/breeding habitat. As such, impacts to potential foraging habitat of the Large-eared Pied Bat were required to be assessed.

Given no other species are considered likely to occur, additional survey effort to supplement the data lost is unlikely to yield additional species.

2.5.1.1.3 Bat call identification analysis

Multiple bat species may call simultaneously, and therefore calls were assigned to a species if >50% of pulses within a sequence were assigned to that species and only passes with a minimum of three pulses classified to the same species were identified. Since linear calls produced by some species (i.e., *Nyctophilus* spp.) cannot be assigned to species level due to characteristic frequency overlap, they were grouped and labelled '*Nyctophilus* species'.

Calls were only positively identified when the defining characteristics were present and there was no chance of confusion between species with overlapping and/or similar calls. In this survey, there were some call sequences that could not be positively identified to species level. Further, some species recorded in this survey can have call profiles that overlap with other species. When overlap occurs, species with similar call profiles are assigned to multi species groups of two or three potential species depending on the characteristics displayed in the recorded call sequences.

Calls with intermediate characteristics were assigned mixed species labels. The species recorded in this survey with overlapping call profiles are described below. Large Bent-winged Bat calls overlap in frequency with those of and *Vespadelus darlingtoni* (Large Forest Bat) in the Sydney Basin.

The calls of Large Bent-winged Bats can be separated from the Forest Bats by a down-sweeping tail which neither of the Forest Bats displays (generally being up-sweeping or absent). Large Bent-winged Bat calls are often variable in pulse shape and time between pulses whereas the Forest Bats commonly have regular, evenly spaced pulses.

2.5.1.1.4 Camera trapping

Camera trapping was undertaken during the preliminary surveys (Niche 2021 a, b, c). Within the study area, three baited camera traps were deployed for a month, between October to November (mean daily temperature between 19 to 22 degrees Celsius) at three locations. No threatened fauna (Eastern Pygmy-possum or Spotted-tailed Quoll) were detected during this period. During the deployment period, the study area was subject to higher-than-average rainfall totals, and this may have had some influence on fauna detectability rates. Targeted, intensive camera trapping was then conducted for the Eastern Pygmy-possum over Summer 2021/2022. It was recorded at seven locations. The Eastern Pygmy-possum, within the Blue Mountains is thought to be widespread but occur in relatively small numbers (pers. Comm. Kylie Madden, DPIE, 2021). They were not detected during previous preliminary camera trapping efforts, most likely due to the relatively low survey effort.

Surveys for Eastern Pygmy-possum (via baited camera trapping) were not possible within the revised proposal area. However, Eastern Pygmy-possum is likely to utilise habitats within the revised proposal area, based on previous surveys in the REF proposal area, the proximity of species records, high landscape connectivity, and the similarity of habitats in the REF proposal area and revised proposal area (same vegetation community and similar availability of potential foraging and nesting resources).

Additional surveys and monitoring are proposed (including the installation of nest boxes within and outside the REF proposal area and revised proposal area) to better understand the size/extent of the local population(s).

2.5.1.1.5 Nocturnal spotlighting

Nocturnal spotlighting was undertaken in each accessible portion of the study area, by two observers over four nights each in Winter and Spring (16 to 19 June 2021 and 13 to 17 September 2021).

The survey effort across the eight nights of survey equated to 42 person hours. The survey effort was considered adequate to address the minimum requirement of the survey guidelines as discussed in section 3.7.2, however, the four nights of survey during June were undertaken during poor weather conditions (cold, windy, rainy and high cloud cover) which is likely to have significantly reduced detectability rates (Table 2-6).

Due to the poor climatic conditions in June 2021, additional nocturnal surveys were conducted in early September 2021. Climatic conditions during nocturnal surveys in September weren't considered optimal, however, they were improved (calm, reduced cloud cover, and an increase in daily temperature; Table 2-6). Nocturnal surveys on both occasions did not identify the presence of threatened arboreal fauna species such as the Koala, Squirrel Glider or Greater Glider.

Table 2-6: Weather conditions during nocturnal surveys

Date	Minimum temperature °C	Maximum temperature °C	Mean temperature °C	Daily rainfall mm	Cloud cover %
16/06/2021	4.1	13.8	8.95	0.2	80
17/06/2021	1.7	6.1	3.9	8.8	100

Date	Minimum temperature °C	Maximum temperature °C	Mean temperature °C	Daily rainfall mm	Cloud cover %
18/06/2021	3.1	7.6	5.35	0.2	100
19/06/2021	3.5	8.6	6.05	0	100
13/09/2021	3	9.2	6.1	0	100
15/09/2021	0.8	12.8	6.8	0.4	65
16/09/2021	1.8	14.4	8.1	0	65
17/09/2021	3.6	18.2	10.9	0.2	50
3/08/2022	3.7	16.0	9.85	0.2	25
4/08/2022	9.9	12.1	11	0.4	100

2.5.1.1.6 Giant Dragonfly transects

During Summer 2021 surveys, two targeted parallel transects were undertaken by two observers across Upland Swamp habitat over two days. The survey effort across the two surveys (7 and 10 December 2021), with two observers, equated to 9.4 person hours.

The survey effort was adequate to address the minimum survey requirements. However, there are many knowledge gaps relating to emergence patterns of this species.

According to the TBDC (2021), there are many knowledge gaps in the ecology of Giant Dragonfly, particularly relating to emergence patterns. Giant Dragonfly lives as a larva for six or more years before emerging as an adult with a short flying season. Emergences are unpredictable in space and time and data to date show complex patterns of spatial synchrony in changing abundance of adults among years.

Targeted parallel transects on both occasions did not identify the presence of Giant Dragonfly.

2.5.1.1.7 Blue Mountains Water Skink pitfall trapping

Dry pitfall trapping was conducted within the Upland Swamp habitat, by two observers over five days in Summer (6 to 10 December 2021).

The survey effort across the five days of survey equated to 265 trapping hours. The survey effort was considered adequate to address the minimum requirement of the survey guidelines as discussed in section 2.4.4, however, the five days of survey during December were considered to be suboptimal weather conditions (cold to mild days, with inconsistent rainfall) for general reptile activity (average maximum temperature of 18 degrees Celsius), which may have reduced detectability rates (Table 2-7).

Table 2-7: Weather conditions during pitfall trapping

Date	Minimum temperature °C	Maximum temperature °C	Mean temperature °C	Daily rainfall mm
6/12/2021	7.6	14.1	10.85	11
7/12/2021	10.7	21.2	15.95	1
8/12/2021	12.4	15.6	14	1.4
9/12/2021	10.2	19.2	14.7	10.2
10/12/2021	5.6	10.1	7.85	11

The survey guidelines for this species (DAWE 2011b), state that drift fencing is not required. Drift fences typically increase the taxonomic range and number of animals captured by directing fauna into the traps. Given that no drift fencing was specified in the guidelines, it is not considered a limitation to the survey in this case.

Dry pitfall trapping did not identify the presence of Blue Mountains Water Skink. Only two common species were identified during trapping efforts, one Eastern Common Froglet (*Crinia signifera*) and one Dark-flecked Garden Skink (*Lampropholis delicata*).

2.5.1.1.8 Threatened flora surveys

Due to shortened project timeframes for finalisation of the revised submission report, the surveys for Small Pale Grass-lily (Caesia parviflora var. minor) and Acacia baueri subsp. aspera was not possible within the revised proposal area. However, to mitigate any potential risk to these species as a result of the proposal pre-clearance targeted surveys (parallel transects 5-metres wide) have been recommended. The pre-clearance surveys are to occur between the recommended survey months of October to February (both species are difficult to detect outside of their flowering periods).

3 Existing environment

3.1 Landscape

The Great Western Highway Upgrade East package is located within the Sydney Basin IBRA Bioregion; and the Wollemi IBRA Subregion.

The REF proposal area and the revised proposal area are underlain by Blue Mountains Plateau landscape complex (Mitchell 2002). This formation is typically described as an elevated, dissected plateau of Triassic quartz sandstones. Thin shale beds form stepped topography and deeply weathered sandstones form pagoda towers and turrets on gorge margins. Exposed high slopes with Dwarf Casuarina (*Allocasuarina nana*) heath, Blue Mountains Ash (*Eucalyptus oreades*) and Silvertop Ash (*Eucalyptus sieberi*) woodlands, and perched swamps. Elsewhere heaths, woodlands, and forests with very high plant diversity on sandy soils.

The positioning of the REF proposal area and revised proposal area is located along the top of the escarpment and is generally flat terrain, with undulating to gradual sloping sections with a north-east aspect in the northern portion of the study area. No rocky outcrops, crevices or cliffs are located within the study area or immediately adjacent (closest clifflines to the study area are about 300 metres away). The proposal would therefore not have a direct impact upon areas of potential geological significance.

3.2 Terrestrial fauna and fauna habitat

Fauna species recorded in the study area are listed in Annexure A. A total 68 species were recorded during field surveys, comprising three reptiles, 29 birds, one amphibian and 36 mammals.

Eight threatened fauna species were recorded during the field survey including:

- Eastern Pygmy-possum (*Cercartetus nanus*)
- Large Bentwing-bat (Miniopterus orianae oceanensis)
- Little Bentwing-bat (*Miniopterus australis*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern Freetail Bat (*Micronomous norfolkensis*)
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*)
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*).

An in-depth assessment of fauna habitat was undertaken in line with Section 6.4 of the BAM, the TBDC habitat constraints requirements for threatened biota and habitat assessment guidelines (DEC 2004c). Blue Mountains National Park and WaterNSW lands are both situated on the top of the escarpment and contain predominantly dry sclerophyll habitat typical of the sandstone plateau. Meanwhile, in the dissecting gully areas of the alignment more mesic vegetation types such as *Blue Mountains Swamp and Narrow-leaved Peppermint – Silvertop Ash – Mountain Grey Gum shrubby open forest* (PCT 967) occur. As such, there is a wide diversity of fauna species that occur across these landscapes. Our assessment identified the following habitat features within the study area (Figure 2-2):

- Forested habitat – likely supporting breeding and foraging habitat for a variety of local fauna, including birds, reptiles, mammals, and frogs.
- Microhabitats including scattered surface rock, fallen logs, leaf litter, fallen timber, ephemeral soaks and hollow-bearing trees.
- One culvert, within the southern portion of the study area.
- 207 hollow-bearing trees within the REF proposal area and 13 within the revised proposal area (220 in total). A full inventory of hollow-bearing trees recorded including the species, approximate Diameter at Breast Height (DBH) and number and size of hollows is provided in Annexure F.

There were no rocky sandstone outcrops and overhangs (likely to support roosting habitat for cave-dependant microbat species, and a variety of fauna species such as reptiles, mammals, and frogs) evident throughout the study area. However, the study area is within proximity to such areas (around 300 metres away).

3.2.1 Forested habitat

The habitats that occur within the study area consist of moderately to highly connected woody/forest habitat types comprising the PCTs discussed in section 3. These occupy around 90 per cent of the study area. Some of these areas are mildly disturbed by edge-effects and fragmentation (from existing and previous urban encroachment), however, forest habitats within the study area have moderate to high connectivity with large patches of native vegetation (e.g. Blue Mountains National Park). They are therefore considered likely to support a high diversity of native fauna species (both sedentary and transient species).

The canopy age class throughout the study area was mixed (some areas with advanced regeneration and some areas with Old Growth Forest), with the DBH of hollow-bearing trees ranging from 15 to 250 centimetres. Midstorey vegetation across much of the study area ranged from moderately dense to patchy and consisted primarily of native species.

The landscape is comprised of gradual and moderate slopes with ephemeral drainage lines and soaks. The ground layer is occupied by a range of forbs, grasses and sedges, fallen woody debris, leaf litter and other organic detritus. The study area generally supported a good amount of ground cover for small mammals and reptiles, fallen woody debris, thick to patchy leaf litter cover and an abundance of feed trees (i.e. flowering eucalypt species, lerp, midstorey species such as Grevillea and Banksia species).

Areas of habitat close to the road edges, are likely to be subject to a high level of noise and light pollution. These factors likely limit these areas to only being suitable for highly urban tolerant species.

Plate 3-1. Patches of woodland immediately adjacent to Great Western Highway within the M2B study area

3.2.2 Hollow bearing trees and fallen timber

A hollow-bearing tree survey was carried out during the June 2021 field survey. The location of hollow-bearing trees and stags are provided in Annexure F and shown on Figure 2-2.

The hollow-bearing trees were predominantly *Eucalyptus sieberi* and *Eucalyptus oreades*. The size of the hollows ranged from less than 5 to 30 centimetres.

Trunks of hollow-bearing trees were inspected for glider feeding scars, and the base was inspected for the presence of owl pellets or prey, to which no evidence of usage was observed during the time of the survey.

Areas of hollow-bearing trees were also observed from vantage points during both diurnal and nocturnal surveys. The only fauna species observed leaving any hollows during the survey were Rainbow Lorikeets (*Trichoglossus haematodus*) and Sulphur-crested Cockatoo (*Cacatua galerita*).

There were eighteen hollow-bearing trees that were considered potential Cockatoo nest trees based on the information provided in the TBDC (hollows of greater than 10 centimetres and at a minimum height of nine metres above ground level) (Figure 2-2, Annexure F).

3.2.3 Culverts

Based on field observations, one concrete culvert was found down gradient of the K2M portion of the study area. The culvert was considered marginal for roosting bats based on dimensions (< 0.5 metres diameter), and the entrance was chocked with vegetation. Despite this, thorough visual inspections of each culvert (i.e. searches for physical presence, guano, staining, ammonia-like odours, evidence of roost points, expansion joints, portholes, cracks and fissures) was not possible at the time of the assessment due to safety/access concerns.

No suitable maternity caves/sites for Large Bentwing-bat or Little Bentwing-bat occur within or nearby the study area.

Plate 3-2. Potential microbat roosting habitat within culvert down-slope of the K2M study area

3.3 Plant community types

The vegetation survey confirmed the presence of three PCTs within the study area:

- PCT 1248 – *Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion*
- PCT 967 – *Narrow-leaved Peppermint – Silvertop Ash – Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion*
- PCT 1078 – *Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion.*

Different condition classes were assigned to areas of vegetation where obvious differences in structure and quality occurred, resulting in three PCTs and six vegetation zones as shown in Table 3-1. In general, all six vegetation zones reflected the edge effects from the existing road, including weed occurrence, sedimentation, erosion and some debris. Additionally, historical, and current clearing for is evident across the site.

Areas of PCT 967 were mainly aligned with creeks or depressions and had a relatively greater diversity and abundance of more mesic understorey species compared to the surrounding vegetation community. PCT 1078 was recorded in one location on intermittently waterlogged soils in a moderate condition with a variety of common wet ferns, sedges and shrubs. PCT 1248 is a broad and variable PCT across much of the study area (Table 3-2). Much of the variability in condition was associated with level of disturbance; sections highly disturbed by development, powerlines and maintenance, were of lower condition, with less canopy cover, lower species diversity and typically higher abundance of exotic species.

Typically, the dominant eucalypts within the study area consisted of Silvertop Ash (*Eucalyptus sieberi*) and Sydney Peppermint (*Eucalyptus piperita*), with some occurrences of Monkey Gum (*Eucalyptus cypellocarpa*), Blue Mountains Ash (*Eucalyptus oreades*) and Blue Mountains Brittle Gum (*Eucalyptus mannifera* subsp. *gullickii*). The mid to ground layer cover of the study area had relatively high instances of Banksia species (*Banksia spinulosa, B. marginata and B. ericifolia),* Mountain Devil (*Lambertia 31ndirec*), Coral Heath (*Epacris microphylla*), Hairy Apple Berry (*Billardiera scandens*) and Common Tussock-grass (*Poa labillardierei* var. *labillardierei*). All of the characteristics of the different PCT vegetation formation, class and descriptions have been derived from DPIE descriptions (DPIE 2021b).

Table 3-2 and Table 3-4 detail the condition of each vegetation zone as well as species composition, conservation status and landscape characteristics for PCT 1248 and PCT 967 respectively.

A full species list for all surveyed plots is provided in Annexure A, and the extent of vegetation within the study area is shown in Figure 2-1.

Table 3-1: Plant community types

Plant community type (PCT)	Vegetation zone	Vegetation integrity score (BAM-C)	Patch size (ha)	Threatened ecological community?
PCT 1248 – *Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.*	Moderate	59.1	>100	No
	Low	41.6	>100	No
	Degraded	5.1	>100	No
PCT 967 – Narrow-leaved Peppermint – Silvertop Ash – Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion.	Moderate	47.1	>100	No
	Low	24.1	>100	No
PCT 1078 – Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion	Moderate	44.5	>100	Yes

Table 3-2: PCT1248 vegetation zones and justification

PCT 1248 – Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.	
Vegetation formation	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Sydney Montane Dry Sclerophyll Forests
Conservation status	Least concern (<20% cleared)
Characteristics of the PCT	DPIE (2021b) characterises PCT 1248 as occurring on sandy loams on elevated sandstone plateaux of the upper Blue Mountains at altitudes of 600-1050 m. It occurs in the Burragorang and Wollemi Subregions. It also includes diagnostic features of a low open forest or woodland with abundant sclerophyll shrubs, and a groundcover of sedges and forbs. **Upper Stratum Species:** *Eucalyptus piperita, Eucalyptus sieberi, Eucalyptus radiata subsp. radiata, Eucalyptus sclerophylla* and *Eucalyptus sparsifolia,* **Mid Stratum Species:** *Banksia serrata, Banksia spinulosa, Daviesia ulicifolia, Hakea dactyloides, Isopogon anemonifolius, Lambertia 32ndirec, Leptospermum trinervium, Lomatia silaifolia, Monotoca scoparia, Persoonia laurina, Persoonia levis, Platysace linearifolia* and *Telopea speciosissima;* **Ground Stratum Species:** *Bossiaea heterophylla, Caustis flexuosa, Dampiera stricta, Entolasia stricta, Lomandra glauca, Lomandra obliqua, Patersonia sericea, Pteridium esculentum* and *Xanthosia 32ndire.*
How it meets the BC Act Final determination	There are no BC Act listed TECs associated with this PCT

PCT 1248 – Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.	
How it meets the EPBC Act Final determination	There are no EPBC Act listed TECs associated with this PCT
Condition	**Moderate**
	The vegetation in this zone is considered to be in moderate condition. The canopy was well established with mature (diameter at breast height (DBH) >80cm) *Eucalyptus sieberi* (Silvertop Ash) and *E. piperita* (Sydney Peppermint) present as well as saplings (signs of regeneration) of these species. A shrub layer predominantly comprised of *Banksia spinulosa* (Hairpin Banksia) and a diverse ground cover of grasses and forbs was present throughout the vegetation zone. Exotic species were present in low numbers throughout the vegetation zone and included species such as, *Taraxacum officinale* (Dandelion) *Conyza bonariensis* (Flaxleaf Fleabane), *Senecio madagascariensis* (Fireweed), *Cirsium arvense* (Thistle), *Pennisetum clandestinum* (Kikuyu Grass) and *Plantago lanceolata* (Lamb's Tongue) in the understorey.
Extent in the study area (ha)	43.95
BAM plots completed	Five (Plots 1, 3, 10, 11 and 13)
BAM-C Composition condition score	70.7
BAM-C Structure condition score	62
BAM-C Function condition score	46.9
BAM-C Vegetation Integrity	59.1
BAM-C Percent cover scores	

Plot number	Tree	Shrub	Grass	Forb	Fern	Other
1	20.3	31.7	11.1	0.8	1.1	0.1
3	50.0	90.2	8.3	5.1	1.0	1.1
10	10.0	0.5	69.5	0.3	0.0	0.0
11	80.0	14.1	3.8	1.3	0.5	1.2
13	70.0	51.6	3.3	1.3	3.2	0.8

PCT 1248 – Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.

Photos

Variation in PCT condition was quite variable; some areas had tall, well-established canopy and shrub cover (Plot 3 and Plot 13), while others had little midstorey cover although high grass or shrub cover (Plot 10).

Plate 3-3: BAM plot 10 start photo in an open paddock with high native grass cover adjacent to the intact dense midstorey with large canopy trees (>50 cm DBH).

Plate 3-4: BAM plot 3 start photo with dense midstorey of *Banksia spinulosa* and large Eucalypt cover.

Plate 3-5: BAM plot 13 end photo with high midstorey and canopy cover although smaller sized canopy trees (<30 cm DBH).

PCT 1248 – Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.	
Justification	The diagnostic canopy species were consistent with the PCT description including *Eucalyptus sieberi*, *E. piperita* and E. *cypellocarpa.* These species were all observed in different densities across the vegetation zone. Most of the trees observed were around 30-50 cm DBH. As seen in the photos, this condition class was variable, although the native species percent cover was consistently high across the various growth forms. The midstorey ranged from a sparse to dense cover of Banksia species which are a diagnostic species of the PCT. Plots sampled confirm the presence of ground cover species diagnostic of PCT 1248, including; *Dampiera stricta, Entolasia stricta, Lomandra glauca, Lomandra obliqua, Patersonia sericea and Pteridium esculentum.*
Condition	**Low** The vegetation in this zone is of a low condition. The canopy is not well established in many areas, with either one or two mature trees (DBH >80 cm) *Eucalyptus sieberi* (Silvertop Ash) and *E. piperita* (Sydney Peppermint) present, as well as saplings (signs of regeneration) of these species. The shrub layer is predominantly missing or having only small seedlings comprising of *Banksia spinulosa* (Hairpin Banksia). There is a diverse ground cover of grasses and forbs present throughout the vegetation zone. A number of the plots in this condition are either under a powerline easement, which follows the existing highway, or adjacent to maintained trails on WaterNSW land. Exotic species are present in a low abundance throughout the vegetation zone and include species such as, *Taraxacum officinale* (Dandelion) *Conyza bonariensis* (Flaxleaf Fleabane), *Senecio madagascariensis* (Fireweed) *Cirsium arvense* (Thistle) *Pennisetum clandestinum* (Kikuyu Grass) and *Plantago lanceolata* (Lamb's Tongue) in the understorey.
Extent in the study area (ha)	23.50
BAM plots completed	Five (Plots 4, 7, 8, 12 and 14)
BAM-C Composition condition score	45.8
BAM-C Function condition score	41.9
BAM-C Structure condition score	37.5
BAM-C Vegetation Integrity	41.6
BAM-C Percent cover scores	

Plot number	Tree	Shrub	Grass	Forb	Fern	Other
4	40.0	20.9	55.6	0.9	0.0	0.2

PCT 1248 – Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.

7	1.0	55.7	7.9	0.0	0.0	2.0
8	30.0	47.5	5.5	0.4	0.1	0.2
12	15.0	60.4	5.8	1.4	0.1	1.5
14	1.0	3.6	39.7	1.8	0.8	0.1

Photos

Plate 3-6: BAM plot 4 start photo in open paddock with similar species composition to moderate condition category with intact old trees (>50 cm DBH) but frequent slashing and maintained as open grassy area.

Plate 3-7: BAM plot 7 start photo – under power line that has maintenance and frequent slashing with regrowth of canopy and midstorey trees.

PCT 1248 – Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.	
	 Plate 3-8: BAM plot 14 across open slashed grassy area with similar species composition to moderate condition category but frequent slashing and intact old trees (>50 cm DBH).
Justification	The diagnostic canopy species present were consistent with the PCT description including *Eucalyptus sieberi, E. piperita* and *E. cypellocarpa.* These species were observed in different densities across the vegetation zone. Most of the trees observed were around 30-50 cm DBH. As seen in the photographs, this condition class was variable. Native species percent cover was generally high and the midstorey ranged from a sparse to dense cover of Banksia and Leptospermum species which are diagnostic species of the PCT. Plots sampled confirm the presence of ground cover species diagnostic of a PCT 1248, including; *Dampiera stricta, Entolasia stricta, Lomandra glauca, Lomandra obliqua, Patersonia sericea and Pteridium esculentum.* This condition state was defined by the on-going and historical clearing/disturbance.
Condition	**Degraded**
	The vegetation in this zone was in a degraded condition. The canopy or midstorey was not well established and the shrub layer was predominantly missing or consisted of only small seedlings comprising Banksia *spinulosa* (Hairpin Banksia) and *Pteridium esculentum* (Bracken Fern), with a high exotic ground cover of *Eragrositc curvula* (African Love grass) throughout the vegetation zone. This vegetation zone was small constituting less than one ha of the native vegetation within the study area.
Extent in the study area (ha)	0.30
BAM plots completed	One (Plot 5)
BAM-C Composition condition score	6.3
BAM-C Structure condition score	1.2

PCT 1248 – Sydney Peppermint – Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.	
BAM-C Function condition score	17.2
BAM-C Vegetation Integrity	5.1
BAM-C Percent cover scores	<table><tr><th>Plot number</th><th>Tree</th><th>Shrub</th><th>Grass</th><th>Forb</th><th>Fern</th><th>Other</th></tr><tr><td>5</td><td>5.0</td><td>4.7</td><td>0.5</td><td>0.0</td><td>2.0</td><td>0.0</td></tr></table>
Photo	 Plate 3-9: BAM plot 5 start photo of mainly exotic grassland patch within study area
Justification	The diagnostic canopy species adjacent to this plot were consistent with the PCT description including *Eucalyptus sieberi, E. piperita* and *E. cypellocarpa.* These species were all observed near this vegetation zone. Most of the trees observed were around 30-50 cm DBH. As seen in the photo, this condition class is an open area dominated by the exotic African Lovegrass and missing many of the diagnostic canopy or midstorey species within the PCT.

Table 3-3: PCT 1078 vegetation zones and justification

PCT 1078 Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion	
Vegetation formation	Freshwater Wetlands
Vegetation class	Coastal Heath Swamps
Conservation status	TEC Listed due to its small geographic distribution coupled with demonstrable threat (5 per cent cleared) **BC Act:** *Vulnerable identified as Blue Mountains Swamps in the Sydney Basin Bioregion* **EPBC Act:** *Endangered identified as Temperate Highland Peat Swamps on Sandstone*

PCT 1078 Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion	
Characteristics of the PCT	PCT 1078 occurs from the Blue Mountains to the Morton Plateau. It has an open shrub canopy with dense groundcover of sedges and forbs. It occurs on humic sandstone soils in headwater valleys of sandstone plateaux at altitudes of 450 to 1,100 m. The Blue Mountains Swamps community to which this PCT is aligned is characterised by a dense mixture of shrubs and sedges, most of which have sclerophyllous foliage. The shrub stratum typically varies from 0.5 m to over 2.0 m tall and is highly variable in cover. The ground stratum may be up to about 1 m tall and is dominated by a dense sward of sclerophyllous sedges and grasses except in patches where these are displaced by a dense cover of taller shrubs. Ferns, forbs and small shrubs are scattered amongst the sedges and grasses. There is considerable local variation within the swamps in species composition and vegetation structure, which is apparently related to local soil properties and fire history. Structure of the vegetation varies from closed heath or scrub to open heath to closed sedgeland or fernland. Among the frequently occurring large shrub species Weeping Baeckea (*Baeckea linifolia*), Prickly Tea-tree (*Leptospermum juniperinum)* and Needlebush (*Hakea teretifolia*) are relatively common, while Woolly Tea-tree (*L. grandifolium*) and *Grevillea acanthifolia* subsp. *acanthifolia* occur primarily on deeper, highly organic, frequently waterlogged soils, and *L.* polygalifolium and Hairpin Banksia (*Banksia spinulosa*) are typically found on intermittently waterlogged, shallower sandy soils with a moderate organic content. Small shrubs, including *Almaleea 39ndirect39*, Blunt-leaf Heath (*Epacris obtusifolia*) and Pink Swamp Heath (*Sprengelia incarnata*), are typically more abundant on the less waterlogged soils. The large tussock sedge Button Grass (*Gymnoschoenus sphaerocephalus*), and rhizomatous sedges and cord rushes, including *Lepidosperma limicola, Ptilothrix deusta, Lepyrodia scariosa* and *Leptocarpus tenax* are generally common throughout the swamps, as are the grasses Wiry Panic (*Entolasia stricta*) and *Tetrarrhena turfosa*. Coral ferns (*Gleichenia spp*.), and Forked Sundew (*Drosera 39ndire*) are typical of frequently waterlogged soils, while other herbs, including *Dampiera stricta*, Heathy Mirbelia (*Mirbelia rubiifolia*) and Raspwort (*Gonocarpus teucrioides*) occur in more open vegetation on intermittently waterlogged soils.
How it meets the BC Act Final determination	The vegetation community within the study area supported the frequently occurring large shrub species *Leptospermum juniperinum* and the study area is within the correct distribution range for this TEC. This patch of the community was also located in the headwater valley of the sandstone plateau. The Blue Mountains Swamps community spans an altitudinal range of around 500 to 950 m above sea level (DPIE 2021c).
How it meets the EPBC Act Final determination	This community forms a component of the community Temperate Highland Peat Swamps on Sandstone which is listed as Endangered under the EPBC Act. Hanging swamps are especially notable in the landscape as they occur on steep valley sides in wet areas created by water exiting the ground at joins between sandstone and claystone layers of rock. The other swamps in this ecological community occur in depressions in the landscape, or along watercourses. The vegetation associated with this ecological community is a complex patchwork of vegetation types and varies from bog and fen associations in the wettest parts of some components, through to sedge associations, and shrub associations in the driest parts of the ecological community. This vegetation zone has eight of the diagnostic species from the species list and meets the description of hanging swamps in the Blue Mountains (DAWE 2021).
Condition	**Moderate**

PCT 1078 Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion	
	The vegetation in this zone was considered to be in moderate condition. It supported a dense, well established shrub layer dominated by characteristic Leptospermum species (*Leptospermum juniperinum,* Prickly Tea-tree) with a mesic ground layer of grasses and ferns, namely Coral Fern (*Gleichenia dicarpa*) and (*Entolasia stricta*). Tall campy trees were absent from this area. There were a few exotic species present within this vegetation zone including Small-leaved Privet (*Ligustrum sinense*) and Blackberry (*Rubus fruticosus sp. agg.).* It was adjacent to low condition PCT 1248 zones across the known extent within the study area.
Extent in the study area (ha)	0.05
BAM plots completed	One (Plot 3) from preliminary surveys (Niche 2021c, plot reference 6629sh03*)
BAM-C Composition condition score	50.3
BAM-C Structure condition score	39.3
BAM-C Function condition score	N/A
BAM-C Vegetation Integrity	44.5
BAM-C Percent cover scores	

Plot number	Tree	Shrub	Grass	Forb	Fern	Other
3*	5	63.5	3.3	1.1	5	25

*This plot was conducted within preliminary surveys in Spring (Niche 2021c)

PCT 1078 Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion	
Photo	 Plate 3-10: BAM plot 3* start photo of Tea-tree dominated swamp vegetation zone *Plot 3 is from preliminary surveys (6629sh03)
Justification	The diagnostic canopy species present were consistent with the PCT description including *Leptospermum juniperinum, Leptospermum polygalifolium, Gahnia sieberiana, Gleichenia dicarpa, Gonocarpus teucrioides, Hemarthria uncinate* and *Todea 41ndirec*. There were scattered Eucalyptus trees throughout the vegetation zone which would suggest a drying out over time and the nearby PCT 1248 starting to encroach into this vegetation zone. As seen in the photo (Plate 3-10), this condition class was present as a dense tea-tree shrub forest dominated by *Leptospermum juniperinum*.

Table 3-4: PCT 967 vegetation zones and justification

PCT 967 *Narrow-leaved Peppermint – Silvertop Ash – Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion.*	
Vegetation formation	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Sydney Montane Dry Sclerophyll Forests
Conservation status	Least concern (<5% cleared)
Characteristics of the PCT	Open forest with a shrubby understorey and ground layer of sedges, forbs and grasses. Occurs on sheltered slopes or high ridges on sandstone plateaux between 650m and 1200m in the western Blue Mountains **Upper Stratum Species:** *Eucalyptus radiata* subsp. *radiata, Eucalyptus sieberi, Eucalyptus cypellocarpa* and *Eucalyptus sparsifolia;* **Mid Stratum Species:** *Acacia obtusifolia, Amperea xiphoclada. Banksia spinulosa, Epacris pulchella, Leucopogon lanceolatus, Lomatia silaifolia, Monotoca scoparia, Persoonia laurina, Leptospermum polygalifolium,*

PCT 967 *Narrow-leaved Peppermint – Silvertop Ash – Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion.*	
	Ground Stratum Species: *Dianella caerulea, Gonocarpus teucrioides, Lomandra glauca, Lomandra longifolia, Pteridium esculentum.*
How it meets the BC Act Final determination	There are no BC Act listed TECs associated with this PCT
How it meets the EPBC Act Final determination	There are no EPBC Act listed TECs associated with this PCT
Condition	**Moderate**
	The vegetation in this zone was considered to be in moderate condition. It supported a tall, well-established canopy supporting mature (DBH >80 cm) *Eucalyptus cypellocarpa* (Monkey Gum) and *E. piperita* (Sydney Peppermint) present as well as saplings (signs of regeneration) of these species. The shrub layer predominantly comprised of more mesic species including *Leptospermum* species (Tea-tree) and Tree ferns, namely *Cyathea australis* (Rough Tree-fern), as well as a diverse ground cover of grasses, ferns and forbs. There were no exotic species present within this vegetation zone although it was adjacent to low condition PCT 1248 zones across much of its extent within the study area.
Extent in the assessment area (ha)	0.90
BAM plots completed	One (Plot 9)
BAM-C Composition condition score	44.2
BAM-C Structure condition score	37
BAM-C Function condition score	63.9
BAM-C Vegetation Integrity	47.1
BAM-C Percent cover scores	

Plot number	Tree	Shrub	Grass	Forb	Fern	Other
9	30.0	3.1	50.7	3.5	30.0	20.2

PCT 967 *Narrow-leaved Peppermint – Silvertop Ash – Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion.*	
Photo	 Plate 3-11: BAM plot 9 start photo with open understorey dominated by Tree-ferns.
Justification	The diagnostic canopy species present were consistent with the PCT description including *E. piperita* and *E. cypellocarpa.* Most of the trees observed were around 30-50 cm DBH. As seen in the photo (Plate 3-11), this condition class was present as an open forest dominated by Rough Tree-ferns and large Eucalyptus trees.
Condition	**Low**
	The vegetation in this zone was in a low condition. The canopy was well established yet had sparse canopy cover with mature (DBH >80cm) *Eucalyptus cypellocarpa* (Monkey Gum) and *E. piperita* (Sydney Peppermint) present as well as saplings (signs of regeneration) of these species, although the majority of this vegetation zone follows the riparian corridor and has a mesic understorey the young Monkey Gums (DBH <30cm) present throughout much of the zone. The shrub layer predominantly comprised of more mesic species *including Leptospermum* (Tea-tree) and *Cyathea australis* (Rough Tree-ferns) and a ground cover dominated by ferns, coinciding with its location between the drier vegetation community of PCT 1248 and adjacent riparian vegetation along the creeks. The ground cover of grasses, ferns and forbs present throughout the vegetation zone was generally diverse. There were no43ndirec species present within this zone although it was adjacent to low condition PCT 1248 zones across much of its extent within the study area.
Extent in the study area (ha)	0.12
BAM plots completed	One (Plot 6)
BAM-C Composition condition score	26.2
BAM-C Structure condition score	12

PCT 967 *Narrow-leaved Peppermint – Silvertop Ash – Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion.*	
BAM-C Function condition score	44.7
BAM-C Vegetation Integrity	24.1
BAM-C percent Cover scores	

Plot number	Tree	Shrub	Grass	Forb	Fern	Other
6	5.0	6.7	12.2	2.2	2.6	76.0

Photo

Plate 3-12: BAM plot 6 start photo low condition due to the age of much of the canopy and the understorey being dominate by one species (*Todea 44ndirec*).

Justification

The diagnostic canopy species within this area were consistent with the PCT description including *E. piperita* and *E. cypellocarpa.* These species were all observed in and near the vegetation zone. Most of the trees observed were around 20-30 cm DBH. As seen in the photos, this condition class consisted of a relatively open area dominated by a ground cover of ferns heading downslope towards the Megalong Valley. The age and lack of canopy cover in this vegetation zone suggest it has either been previously disturbed and slowly returning or has started drying out over time and the larger canopy trees of the adjacent vegetation community (PCT1248) have established.

3.4 Weeds

Weed species commonly found across the study area included: *Taraxacum officinale* (Dandelion), *Sonchus oleraceus* (Common Sowthistle), *Eragrostis curvula* (African Lovegrass), and *Senecio madagascariensis* (Fireweed).

Weeds that were recorded throughout the BAM plots collected that are regarded as 'High Threat Weeds', include the following: *Ligustrum sinense* (Small-leaved privet), *Rubus fruticosus* sp. *agg.* (Blackberry), *Bidens pilosa* (Cobblers pegs), and *Juncus acutus*.

3.5 Threatened ecological communities

A list of TECs occurring or potentially occurring within 10 kilometres of the study area as generated from the database searches is detailed in section 3.5 and Annexure B. The database searches identified five TECs that have been identified as potentially occurring within the locality.

Based on the results of the detailed vegetation validation and review of the listing advice and descriptions of the TECs (as provided in section 3.3), it has been determined that one of the PCTs recorded within the study area aligns to a TEC under the BC Act and EPBC Act: PCT 1078 *Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion*.

This PCT aligns to Blue Mountains Swamps in the Sydney Basin Bioregion listed as Vulnerable under the BC Act. It also forms a component of the TEC Temperate Highland Peat Swamps on Sandstone which is listed as Endangered under the EPBC Act.

3.6 Groundwater dependent ecosystems

According to the Groundwater Dependent Ecosystems Atlas (Bureau of Meteorology 2021b), no potential Groundwater Dependent Ecosystem's (GDEs) occur within the study area.

However, it is known that Blue Mountains Swamps are formed via groundwater that seeps through permeable sandstone layers with perched aquifers being the primary water source (Spencer and Merson 2018). The Swamps are very reliant on groundwater discharge, with some rainfall and surface runoff intersecting perched groundwater aquifers.

Despite the Atlas identifying no GDE's within the study area, it is known that the PCT associated with Blue Mountains Swamp (PCT 1078 *Prickly Tea-tree – sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion*) is reliant on a combination of surface and groundwater flows.

3.7 Threatened species

3.7.1 Threatened flora results

A total of 37 threatened flora species were considered as potential subject species (Annexure B and Table 3-5). These species were identified through the database searches as having a moderate to high likelihood of occurrence or as generated by the BAM-C. Table 3-5 lists the subject species, required survey timing, habitat constraints and presence within the REF proposal area.

Of the 37 subject species, one threatened flora species was recorded within the REF proposal area. Needle Geebung (*Persoonia acerosa*) was recorded within the REF proposal area during pre-clearing surveys for geotechnical investigations as part of the broader project (Figure 3-1).

Needle Geebung is listed as Vulnerable under the BC Act and is a Species Credit Species under the BAM. The individual was located on 4 May 2021 by Niche ecologist, Jessie Bear during the pre-clearing works associated with geotechnical investigations for the proposal.

Plate 3-13: *Persoonia acerosa* found during a pre-clearing assessment within the study area.

As such, potential impacts to this species have been considered further in formal assessments of significance (Five-part Tests of Significance, ToS) under section 7.3 of the BC Act (Annexure D).

The remaining species were either surveyed (and not detected) or have been excluded due to lack of suitable habitat within the proposal area.

Table 3-5: Subject flora species (bold = recorded or assumed present and ToS conducted)

Source	Common name	Species name	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Recorded, absence or assume presence	Survey timing (TBDC)
BioNet/ BAM-C	*Acacia baueri* subsp. *aspera*	*Acacia baueri subsp. aspera*	V	-	Yes	None	No - surveyed (Spring)	Sep – Apr
BioNet	Klaphake's Sedge	*Carex klaphakei*	V	-	Yes	None	No – surveyed (Spring). Additional surveys to be conducted in December 2021.	Nov – Feb
BAM-C	*Acacia bynoeana*	*Acacia bynoeana*	E	V	Yes	None	No -surveyed (November 2021, and December 2021, July 2022)	Any
BAM-C	Flockton Wattle	*Acacia flocktoniae*	V	V	Yes	None	No -surveyed (Spring 2021 and Winter 2022)	Jul – Sep
BAM-C	Acacia gordonii	*Acacia gordonii*	E	E	Yes	Rocky area, sandstone outcrops, ridgetops, spurs or within 200m	No -surveyed (Spring)	Any
BAM-C	Acacia meiantha	*Acacia meiantha*	E	E	Yes	None	No -surveyed (Spring)	Jul – Oct
BAM-C	Thick-leaf Star-hair	*Astrotricha crassifolia*	V	V	Yes	None	No -surveyed (Spring 2021, and Winter 2022)	Jul-Dec
BioNet/ BAM-C	Deane's Boronia	*Boronia deanei*	V	V	Yes	Other, riparian areas and drainage lines or within 100 m of Swamps, Margins of swamps or within 100m	No -surveyed (Spring)	Oct – Nov
BioNet/ BAM-C	Small Pale Grass-lily	*Caesia parviflora var. minor*	E	-	Yes	None	No -surveyed (Spring)	Oct – Feb
BioNet/ BAM-C	Megalong Valley Bottlebrush	*Callistemon megalongensis*	CE	CE	Yes	None	No -surveyed (Summer, November, and December)	Nov – Dec
BAM-C	Darwinia peduncularis	*Darwinia peduncularis*	V	-	Yes	Rocky area, or within 50m of rocky areas	No -surveyed (Spring)	Any

Source	Common name	Species name	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Recorded, absence or assume presence	Survey timing (TBDC)
BioNet/ BAM-C	Epacris hamiltonii	*Epacris hamiltonii*	E	E	Yes	Watercourses or within 100m Semi-permanent/ephemeral wet areas	No – surveyed in accordance with the threatened flora species survey guidelines	Sep – Dec
BAM-C	Capertee Stringybark	*Eucalyptus cannoni*	V	-	Yes	None	No -surveyed (Spring)	Any
BioNet/ BAM-C	Eucalyptus copulans	*Eucalyptus copulans*	E	E	Yes	None	No -surveyed (Spring and Winter)	Any
BAM-C	Superb Midge Orchid	*Genoplesium superbum*	E	-	Yes	None	No – surveyed (Autumn)	Feb- Mar
BioNet/ BAM-C	Narrow-leaf Finger Fern	*Grammitis stenophylla*	E	-	Yes	None	No -surveyed (Spring)	Any. After significant rainfall event
BAM-C	Evans Grevillea	*Grevillea evansiana*	V	V	Yes	None	No -surveyed (Spring)	Any
BioNet	Fletcher's Drumsticks	*Isopogon fletcheri*	V	V	Yes	On or within 50 m of cliffs, escarpments, or waterfalls	No – habitat constraint does not present within study area	Oct – Dec
BioNet/ BAM-C	Cambage Kunzea	*Kunzea cambagei*	V	V	Yes	None	No -surveyed (Spring)	Oct – Nov
Bam-C	Bristly Shield Fern	*Lastreopsis hispida*	E	-	Yes	None	No – habitat constraint does not present within study area	Any
BAM-C	Rylstone Bell	*Leionema sympetalum*	V	V	Yes	None	No – No habitat presents within the study area	Jun-Aug
BioNet/ BAM-C	Evans Sedge	*Lepidosperma evansianum*	V	-	Yes	Moist sandstone cliffs, pagodas, ledges, shelves, gullies and/or foot slopes or within 50 m	No -surveyed (Summer, November, and December)	Nov – Apr
BioNet/ BAM-C	Woronora Beard-heath	*Leucopogon exolasius*	V	V	Yes	None	No – (surveyed Winter 2022)	Aug – Sep

Source	Common name	Species name	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Recorded, absence or assume presence	Survey timing (TBDC)
BAM-C	**Needle Geebung**	***Persoonia acerosa***	**V**	**V**	**Yes**	**None**	**Yes – surveyed (identified during Geotechnical investigations, Winter 2021)**	**Any**
BioNet/ BAM-C	Persoonia hindii	*Persoonia hindii*	E	-	Yes	None	No -surveyed (Spring 2021 and Winter 2022)	Any
BAM-C	Hairy Geebung	*Persoonia hirsuta*	E	E	Yes	None	No -surveyed (Spring)	Any
BioNet/ BAM-C	Clandulla Geebung	*Persoonia marginata*	V	V	Yes	None	No -surveyed (Spring)	Jan -Mar
BioNet/ BAM-C	Dwarf Mountain Pine	*Pherosphaera fitzgeraldii*	E	E	Yes	Sandstone cliffs, ledges or foot slopes or within 100m	No -surveyed (Spring)	Any
BioNet/ BAM-C	Slaty Leek Orchid	*Prasophyllum fuscum*	CE	V	Yes	None	No -surveyed (Summer, November, and December)	Nov – Dec
BioNet/ BAM-C	Musty Leek Orchid	*Prasophyllum pallens*	V	-	Yes	None	No -surveyed (Summer, November, and December)	Nov- Dec
BAM-C	Wollemi Mint-bush	*Prostanthera cryptandroides subsp. cryptandroides*	V	V	Yes	None	No -surveyed (Spring)	Sep – Nov
BioNet/ BAM-C	Smooth Bush-Pea	*Pultenaea glabra*	V	V	Yes	Other, riparian areas and drainage lines or within 100 metres swamps, or within 100 metres of waterbodies, or within 100 metres	No -surveyed (Spring)	Sep – Nov
BAM-C	Pultenaea sp. Olinda	*Pultenaea sp. Olinda*	E		Yes	Rocky areas	No -surveyed (Spring)	Sep – Oct
BioNet/ BAM-C	Velleia perfoliata	*Velleia perfoliata*	V	V	Yes	None	No -surveyed (Spring)	Sep – Nov
BioNet/ BAM-C	Veronica blakelyi	*Veronica blakelyi*	V	-	Yes	None	No -surveyed (Spring)	Dec – Feb

Source	Common name	Species name	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Recorded, absence or assume presence	Survey timing (TBDC)
BioNet/ BAM-C	Xanthosia scopulicola	*Xanthosia scopulicola*	V	-	Yes	Land within 100 metres of sandstone cliffs, ledges or footslopes	No -surveyed (Summer, November and December)	Nov- Jan
BAM-C	Velvet Zieria	*Zieria murphyi*	V	V	Yes	None	No -surveyed (Spring)	Sep-Nov

3.7.2 Threatened fauna results

A total of 67 threatened fauna species were considered as potential subject species (Annexure B and Table 3-6). These species were identified through the database searches as having a moderate to high likelihood of occurrence or as generated by the BAM-C. Annexure B provides detail on the habitat requirements of each species and their likelihood of occurrence. Table 3-6 lists the subject species, required survey timing, habitat constraints and presence within the REF proposal area based on survey results and presence of suitable habitat.

Of the 67 threatened fauna species, eight threatened fauna species, including two birds, five microbats and one arboreal mammal were recorded within the study area during the current assessment and preliminary surveys (Niche 2021 a, b, c) (Figure 3-1):

- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*): listed as Vulnerable under the BC Act and is an Ecosystem Credit Species under the BAM: The species was visually identified during diurnal surveys in the M2B study area (Figure 3-1).
- Gang-gang Cockatoo (*Callocephalon fimbriatum*): listed as Vulnerable under the BC Act and a dual credit species under the BAM. The species was identified in the study area during Summer 2021 diurnal field surveys (flying above the canopy) and in the broader study area; just to the north in Sutton Park during Spring 2020 diurnal surveys. Targeted survey of potential nest trees indicated the species was not using potential nest trees within the study area for breeding. Therefore, the species is identified as an Ecosystem Credit Species for the purpose of this assessment.
- Large Bentwing-bat (*Miniopterus orianae oceanensis*): listed as Vulnerable under the BC Act and a dual credit species under the BAM. However, as there is an absence of breeding habitat, the species is identified as an Ecosystem Credit Species under the BAM for the purposes of this assessment. The species was acoustically recorded at one of the three Anabat locations (Figure 3-1).
- Little Bentwing-bat (*Miniopterus australis*): listed as Vulnerable under the BC Act and a dual credit species under the BAM. However, as there is an absence of breeding habitat, the species is identified as an Ecosystem Credit Species for the purposes of this assessment. The species was acoustically recorded at one of the three Anabat locations (Figure 3-1).
- Greater Broad-nosed Bat (*Scoteanax rueppellii*): listed as Vulnerable under the BC Act and is an Ecosystem Credit Species under the BAM. The species was acoustically recorded at one of the three Anabat locations (Figure 3-1).
- Eastern Freetail Bat (*Micronomous norfolkensis*): listed as Vulnerable under the BC Act and is an Ecosystem Credit Species under the BAM. The species was acoustically recorded at one of the three Anabat locations (Figure 3-1).
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*): listed as Vulnerable under the BC Act and is an Ecosystem Credit Species under the BAM. The species was acoustically recorded at one of the three Anabat locations (Figure 3-1).
- Eastern Pygmy-possum (*Cercartetus nanus*): listed as Vulnerable under the BC Act and is a Species Credit Species under the BAM. The species was recorded at seven of the 45 remote camera locations within the REF proposal area (Figure 3-1).

Twenty-five species recorded or identified with a moderate or higher likelihood of occurrence (that could not be discounted as occurring within the subject area) were considered further in formal assessments of significance (Five-part Tests of Significance, ToS) under section 7.3 of the BC Act (Annexure D) and/or the EPBC Act.

The remaining species were either surveyed (and not detected) or were excluded due to lack of suitable habitat within the REF proposal area and revised proposal area.

Table 3-6: Subject fauna species (bold = recorded or assumed present and ToS conducted)

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
PMST	Grey Falcon	*Falco hypoleucos*	E	V	No	NA	NA	No surveys required. May frequent the study area on occasion.
BAM-C	Brush-tailed Phascogale	*Phascogale tapoatafa*	V		Yes	Hollow-bearing trees	Dec- Jun	Absent – based on lack of suitable habitat and surveys conducted
BioNet/ BAM-C	**Scarlet Robin**	***Petroica boodang***	**V**		**No**	**Breeding and non-breeding habitat is very different, key should be protecting breeding habitat. The species will occupy smaller patches outside breeding season. Paddock trees are used for roosting and foraging.**	**July – Jan**	**No surveys required. Moderate likelihood of occurrence**
BioNet/ BAM-C	**Flame Robin**	***Petroica phoenicea***	**V**		**No**	**None**	**Late Summer**	**No surveys required. Moderate likelihood of occurrence**
BioNet/ BAM-C	**Varied Sitella**	***Daphoenositta chrysoptera***	**V**		**No**	**None**	**-**	**No surveys required. Moderate likelihood of occurrence**
BioNet	Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V		No	Data for this species is complicated by resident and migratory components of populations, with the greater tendency to migration in south of state. The species uses paddock trees for nesting.	-	No surveys required. Low to moderate likelihood of occurrence. Lack of suitable nesting habitat.
BioNet/ BAM-C	**Yellow-bellied Sheathtail Bat**	***Saccolaimus flaviventris***	**V**		**No**	**Hollow-bearing trees. Roost requirements poorly known, paddock trees should be flagged as potential roosts.**	**-**	**Recorded**
BioNet/ BAM-C	**Diamond Firetail**	***Stagonopleura guttata***	**V**		**No**	**The species uses paddock trees for nesting.**	**-**	**No surveys required. Moderate likelihood of occurrence**
BioNet/ BAM-C	**Hooded Robin (south-eastern form)**	***Melanodryas cucullata cucullata***	**V**		**No**	**Paddock trees can be important for this species as they can link remnant foraging habitat.**	**Jul and Nov**	**No surveys required. Moderate likelihood of occurrence**
BioNet/ BAM-C	**Gilbert's Whistler**	***Pachycephala inornata***	**V**		**No**	**None**	**-**	**No surveys required. Moderate likelihood of occurrence**

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
BioNet/ BAM-C	**Rosenberg's Goanna**	***Varanus rosenbergi***	**V**		**No**	**Broad-ranging species that is difficult to survey – very transient.**	**-**	**No surveys required. Moderate likelihood of occurrence**
BioNet/ BAM-C	**Eastern Cave Bat**	***Vespadelus troughtoni***	**V**		**Ecosystem/ Species credit species**	**Breeding habitat is PCTs associated with the species within 100m of rocky areas, caves, overhangs crevices, cliffs and escarpments, or old mines or tunnels, old buildings, and sheds within the potential habitat.**	**Nov – Jan**	**Surveyed (Spring 2020 and Summer 2021) – not recorded**
BAM-C	**Squirrel Glider**	***Petaurus norfolcensis***	**V**		**Yes**	**TBDC: none** **Requires abundant hollow bearing trees and a mix of eucalypts, banksias, and acacias.**	**All year**	**Absent – surveyed**
BAM-C	Red-crowned Toadlet	*Pseudophryne australis*	V		Yes	TBDC: none Requires ephemeral drainage lines, however, no permanent soaks with sandstone geologies and adequate pooling habitat to support this species.	All year	Absent – based on lack of required habitat constraints
BioNet/ BAM-C	Southern Brown Bandicoot (eastern)	*Isoodon obesulus obesulus*	E	E	Yes	TBDC: Requires dense ground cover in a variety of habitats. Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate, and rainfall.	All year	Absent – surveyed
BioNet/BAM-C	Brush-tailed Rock-wallaby	*Petrogale penicillata*	V	V	Yes	TBDC: Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines. Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland, and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	All year	Absent – based on lack of required habitat constraints

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
BioNet/ BAM-C	**Koala**	***Phascolarctos cinereus***	**V**	**V**	**Ecosystem/ Species**	**TBDC: Areas identified via survey as important habitat.** **Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate, and rainfall.**	**All year**	**Absent – surveyed**
BAM-C	Glossy Black-Cockatoo	*Calyptorhynchus lathami*			Ecosystem/ Species	TBDC: Living or dead trees with hollows greater than 15cm diameter and greater than 8m above ground (breeding); Presence of Allocasuarina and Casuarina species (foraging)	Jan – Sep	Absent – surveyed
BAM-C	Little Eagle	*Hieraaetus morphnoides*			Ecosystem/ Species	TBDC: Nest trees – live (occasionally dead) large old trees within vegetation).	Aug – Sep	Absent – based on lack of required habitat constraints
BAM-C	Broad-headed Snake	*Hoplocephalus bungaroides*	E1	V	Ecosystem/ Species	TBDC: Rocky areas including escarpments, outcrops and pagodas within the Sydney Sandstone geologies (breeding)	Aug – Sep	Absent – based on lack of required habitat constraints
BioNet/ BAM-C	**Little Bent-winged Bat**	***Miniopterus australis***	**V**		**Ecosystem/ Species (Breeding only)**	**TBDC: Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature. Little Bent-wing Bat roost in caves, in old mines, in tunnels, under bridges, or in similar structures.**	**Dec – Jan**	**Recorded**
BioNet/ BAM-C	**Large Bent-winged Bat**	***Miniopterus orianae oceanensis***	**V**		**Ecosystem/ Species (Breeding only)**	**TBDC: Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC – in cave;" observation type code "E nest-roost;" with numbers of individuals >500.**	**Dec – Feb**	**Recorded**
BioNet/ BAM-C	Giant Dragonfly	*Petalura gigantea*	E		Yes	TBDC: Within 500 m of swamps. Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence.	Dec – Jan	Absent – surveyed

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
BioNet	White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V		Ecosystem/ Species (Breeding only)	TBDC: Living or dead mature trees within suitable vegetation within 1km of rivers, lakes, large dams or creeks, wetlands and coastlines Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines (breeding) AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period.	July – Dec	Absent. Habitat constraint not present (surveyed)
BAM-C/ PMST	Littlejohn's Tree Frog	*Litoria littlejohni*	V	V	Yes	TBDC: none Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Waterbodies including semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks	July – Nov	Absent – lack of suitable habitat
BAM-C	Powerful Owl	*Ninox strenua*	V		Ecosystem/Species (Breeding only)	TBDC: Hollow-bearing trees. Living or dead trees with hollow greater than 20cm diameter	May – Aug	Absent – surveyed
BAM-C	Masked Owl	*Tyto novaehollandiae*	V		Ecosystem/Species (Breeding only)	TBDC: Living or dead trees with hollows greater than 20cm diameter.	May – Aug	Absent – surveyed
BAM-C	Sooty Owl	*Tyto tenebricosa*	V		Ecosystem/Species (Breeding only)	TBDC: The species requires Caves or clifflines/ledges and living or dead trees with hollows greater than 20cm diameter. Predominantly occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	April – Aug	Absent – surveyed
BioNet/ PMST/ BAM-C	**Large-eared Pied Bat**	***Chalinolobus dwyeri***	**V**	**V**	**Yes**	**TBDC: Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.**	**Nov – Jan**	**Absent – surveyed (Spring 2020 and Summer 2021) – not recorded**

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
BioNet/ PMST /BAM-C	Booroolong Frog	*Litoria booroolongensis*	E1	E	Yes	TBDC: none The species occupies streams ranging from small slow-flowing creeks to large rivers and the adults are found on or near cobble banks and other rock structures within stream margins and shelter under rocks or amongst vegetation near the ground on the stream edge.	Oct – Dec	Absent – lack of suitable habitat
BioNet/ BAM-C	**Gang-gang Cockatoo**	***Callocephalon fimbriatum***	**V**		**Ecosystem/** **Species (Breeding only)**	**TBDC: Hollow-bearing trees: Eucalypt tree species with hollows greater than 9 cm diameter Potential nest trees are forest and woodland eucalypts containing hollows that are; (i) at least 9 m above the ground; and (ii) with hollow diameter of 10 cm or larger.**	**Oct -Jan** **Dusk/dawn stag watching.**	**Recorded (Summer 2021) – foraging habitat only (no breeding recorded within the study area)**
BAM-C	**Eastern Pygmy-possum**	***Cercartetus nanus***	**V**		**Yes**	**TBDC: none** **Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to inhabit a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5-month period.**	**Oct – Mar**	**Recorded (Summer 2021)**
BioNet	Southern Myotis	*Myotis macropus*	V		Yes	TBDC: Hollow-bearing trees within 200 m of riparian zone (minimum stream width of 3 m). This includes rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site. Bridges, caves or artificial structures within 200 m of riparian zone	Oct – Mar	Absent – lack of suitable habitat
BAM-C	**Grey-headed Flying-fox**	***Pteropus poliocephalus***	**V**	**V**	**Ecosystem/ Species (Breeding only)**	**TBDC: Breeding camps. Requires breeding camps within the proposal area to be considered as a species credit species**	**Oct – Dec**	**Assume presence (foraging habitat only – no breeding camps present)**

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
BioNet/ BAM-C/ PMST	Giant Burrowing Frog	*Heleioporus australiacus*	V		Yes	TBDC: none Dependent on hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin.	Sep – May	Absent – lack of suitable habitat
BAM-C	Blue Mountains Water Skink	*Eulamprus leuraensis*	E1	E	Yes	TBDC: Survey should be undertaken during the hotter months, when >25°C, avoiding wet weather (rain or showers). The main threat is hydrological disturbance through longwall mining by subsidence, damage to the substrate and subsequent loss of water from the swamp. Other major threats include inappropriate fire regimes and clearing.	Oct – Mar	Absent – surveyed
BAM-C/ PMST	Square-tailed Kite	*Lophoictinia isura*	V		Ecosystem/ Species (Breeding only)	TBDC: Nest trees – live (occasionally dead) large old trees within vegetation) AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy	Sep – Jan	Absent – based on habitat constraints
BAM-C	Purple Copper Butterfly, Bathurst Copper Butterfly	*Paralucia spinifera*	E	V	Yes	TBDC: Bursaria spinosa or within 40m of Bursaria spinosa.	Sep – Dec	Absent – lack of required habitat
BioNet/ PMST	**Spotted-tailed Quoll**	***Dasyurus maculatus***	**V**	**E**	**No**	**TBDC: none** **Uses small patches and highly fragmented landscapes. Whilst survey is not required for an ecosystem credit species IF survey is undertaken (for other purposes) cameras can be used throughout the year however trapping should be limited to Dec to Oct, post breeding months (Sept to Nov) where females have dependent young should be avoided. Paddock trees can be used for denning in cleared landscape, as can other habitat (e.g. windrows). Species regularly uses hollows for denning and is dependent on hollow-dependent prey in many parts of NSW.**	**NA**	**Ecosystem credit species – not recorded during targeted survey but potential to occur**
BioNet/ PMST	**Greater Glider**	***Petauroides volans***		**V**	**Yes**	**TBDC: Hollow-bearing trees** **The species is allocated to species credit because it occurs across a broad range of**	**All year**	**Absent – surveyed**

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
						vegetation types and can be reliably detected from survey.		
BAM-C	**Brown Treecreeper (eastern subspecies)**	***Climacteris picumnus victoriae***	**V**		**No**	**TBDC: none**	**NA**	**Recorded – surveyed**
BAM-C	Barking Owl	*Ninox connivens*	V		Species/ Ecosystem	BAM-C; Potential nest trees are living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground. Where potential nest trees are identified on site then, night monitoring at the identified potential nest locations for a minimum of 2 nights should be undertaken to detect the presence of any owl of this species using a potential nest tree or demonstrating territorial behavior near a potential nest tree (e.g. investigating the hollow or roosting within 10 m).	May – Dec	Absent - habitat assessment and nocturnal surveys did not identify individuals or potential nesting habitat
PMST	Stuttering Frog	*Mixophyes balbus*	E	V	Yes	TBDC: none Associated with permanent streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones.	Sep – Mar	Absent – habitat assessment
BioNet	Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Ecosystem/Species	TBDC: As per mapped areas. The species is a dual credit species, mapped important areas are a species credit, these areas do not require survey and any impact from development could be potentially serious and irreversible. Ecosystem credit areas are unlikely to be potential serious and irreversible impacts.	NA	Assume presence (opportunistic foraging only).
BioNet	Speckled Warbler	*Chthonicola sagittata*	V		No	TBDC: none	NA	Assume presence
BioNet	**Eastern False Pipistrelle**	***Falsistrellus tasmaniensis***	**V**		**No**	**TBDC: none**	**NA**	**Assume presence**

Source	Common name	*Species name*	BC Act	EPBC Act	Species credit species?	Habitat constraint (TBDC)	Survey timing (TBDC)	Recorded, absent or assumed presence
BioNet	**Little Lorikeet**	***Glossopsitta pusilla***	**V**		**No**	**TBDC: none**	**NA**	**Assume presence**
PMST	White-throated Needletail	*Hirundapus caudacutus*		V	No	TBDC: none	NA	Assume presence
BioNet /PMST	Swift Parrot	*Lathamus discolor*	E	CE	Species/ Ecosystem	TBDC: As per mapped areas The species is a dual credit species, with the species credit component mapped as an important area. These mapped areas do NOT require survey as it is presumed that the species is present.	NA	Assume presence (opportunistic foraging habitat only).
BioNet	**Black-chinned Honeyeater**	***Melithreptus gularis gularis***	**V**		**No**	**TBDC: none**	**NA**	**Assume presence**
BioNet	Blue-billed Duck	*Oxyura australis*	V		No	TBDC: none	NA	Absent – based on lack of suitable habitat
BioNet/ PMST	New Holland Mouse	*Pseudomys novaehollandiae*		V	No	TBDC: none Habitat used are relatively well known for coastal populations and therefore can be predicted to occur on a site based on vegetation and landscape attributes.	NA	Absent – based on lack of suitable habitat and targeted survey conducted
BioNet	**Greater Broad-nosed Bat**	***Scoteanax rueppellii***	**V**		**No**	**TBDC: none**	**NA**	**Recorded**
BAM-C	**Eastern Coastal Free-tailed Bat**	***Micronomous norfolkensis***	**V**		**No**	**TBDC: none**	**NA**	**Recorded**

3.8 Aquatic results

No aquatic habitats and/or threatened aquatic species listed under the FM Act were identified within the study area, and therefore they have not been considered further in this report.

3.9 Areas of outstanding biodiversity value (where applicable)

AOBV are special areas that contain irreplaceable biodiversity values that are important to the whole of NSW, Australia or globally. Areas of declared critical habitat under the repealed Threatened Species Conservation Act 1995 have become the first AOBV in NSW.

There are no known AOBV within the study area, therefore they have not been considered further in this report.

3.10 Wildlife connectivity corridors

The REF proposal area, revised proposal area and study area is surrounded by native vegetation to the north, northeast, west and southwest and is moderately to well-connected to the surrounding Blue Mountains National Park and WaterNSW lands. However, portions of the study area have been previously impacted by historical land clearing, residential and commercial development, and existing infrastructure which has slightly reduced the connectivity of portions of the study area.

3.11 Koala Habitat Protection State Environmental Planning Policy 2021

The Koala Habitat Protection SEPP 2021 came into force on 17 March 2021. It replaced the repealed Koala Habitat Protection SEPP 2020 (which replaced the Koala Habitat Protection SEPP 2019 on 30 November 2020), and was in force from November 2020 until March 2021) for specific areas of NSW, as follows:

- The 83 LGAs on the Koala SEPP LGA list (https://www.planning.nsw.gov.au/Policy-and-Legislation/Environment-and-Heritage/Koala-Habitat-Protection-SEPP/Koala-SEPP-LGA-list)
- In nine of the listed LGAs (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly, Central Coast) Koala Habitat Protection SEPP 2021 applies to all zones
- In the remaining 74 LGAs the Koala Habitat Protection SEPP 2021 applies to all zones except to land zoned RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry. Koala Habitat Protection SEPP 2020 continues to apply to these zones.

The Koala Habitat Protection SEPP 2021 reinstates the policy framework of Koala Habitat Protection SEPP 2019, whereby the assessment process of Koala habitat is first determined by the application of a Koala plan of management to the subject land and then by the potential for the proposed developed to impact Koalas and/or their habitat. A Koala Assessment Report may be required where there is potential for impact. The Koala Habitat Protection SEPP 2020 replicates the objectives and provisions of SEPP 44 – Koala Habitat Protection, which was in force from 1995 through to 2019.

The principles of the Koala SEPP 2021 are to:

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

Blue Mountains LGA is listed as an LGA to which the Koala Habitat Protection SEPP 2021 applies to all zones. The land in the study area is zoned E1 (National Parks and Nature Reserves), E2 (Environmental Conservation) or E3 (Environmental Management), therefore the Koala SEPP 2021 would apply. However, the Koala Habitat Protection SEPP 2021 applies to development under Part 4 of the EP&A Act. As this proposal is being assessed under Part 5.1 of the EP&A Act, the provisions of the Koala Habitat Protection SEPP 2021 and the Local Environmental Plan do not apply in relation to the assessment of Koala habitat.

3.12 Matters of National Environmental Significance

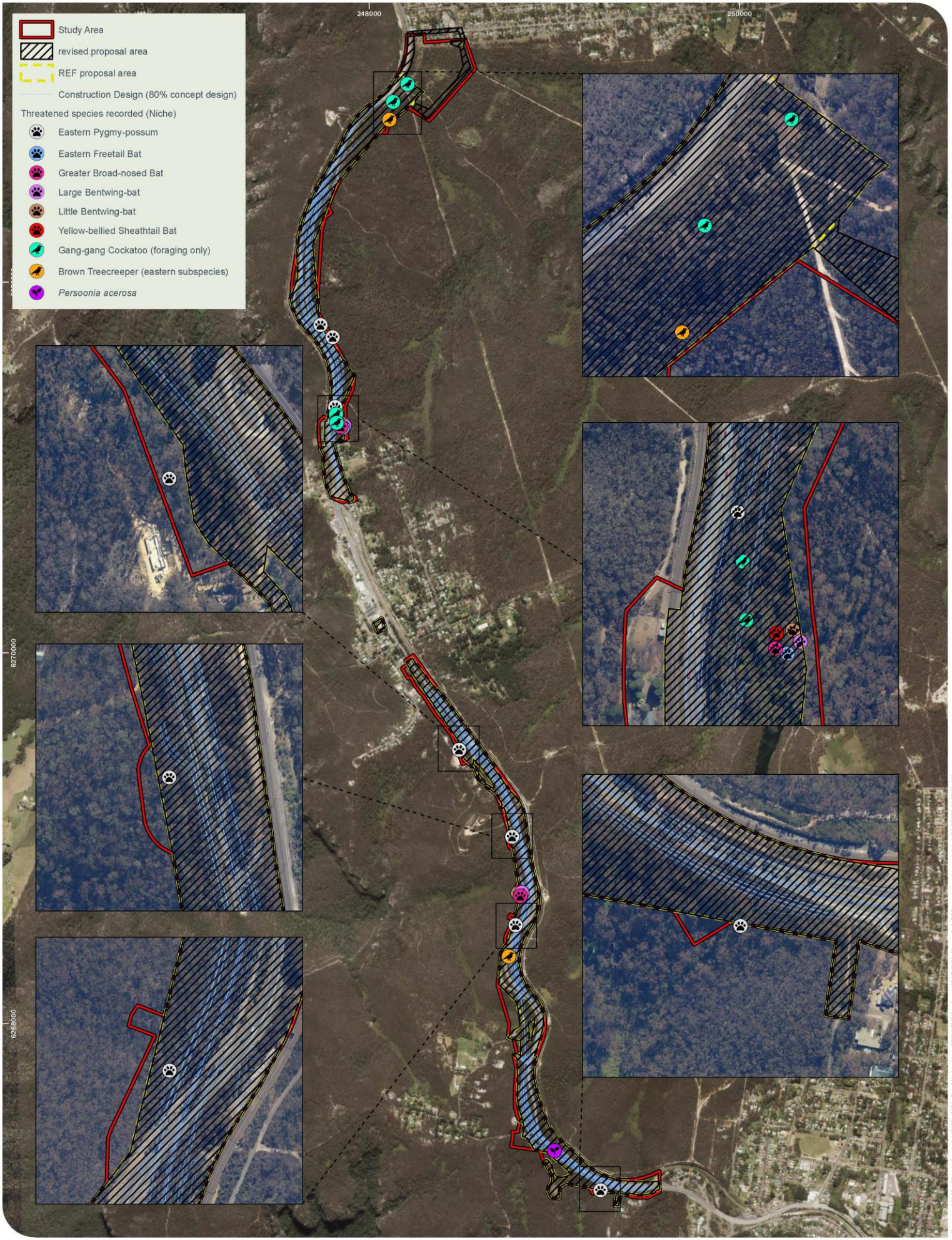
3.12.1 EPBC Act listed threatened flora

The PMST listed 34 threatened flora species that may have habitat within the REF proposal area and locality (Annexure B). One EPBC Act listed flora species, Needle Geebung, was recorded in the REF proposal area and will be impacted by the proposal. As such, an assessment of the significance of potential impacts to this species was undertaken (Annexure E).

3.12.2 EPBC Act listed threatened fauna

The PMST listed 27 threatened fauna species and 14 migratory species that may have habitat within the proposal area and locality.

Four EPBC Act listed fauna species were considered to have the potential to occur and be impacted by the proposal and could not be ruled out based on surveys undertaken to date. These were: Large-Eared Pied Bat, Greater Glider and Grey Headed Flying Fox. As such, an assessment of the significance of potential impacts to each of these species was undertaken (Annexure E).



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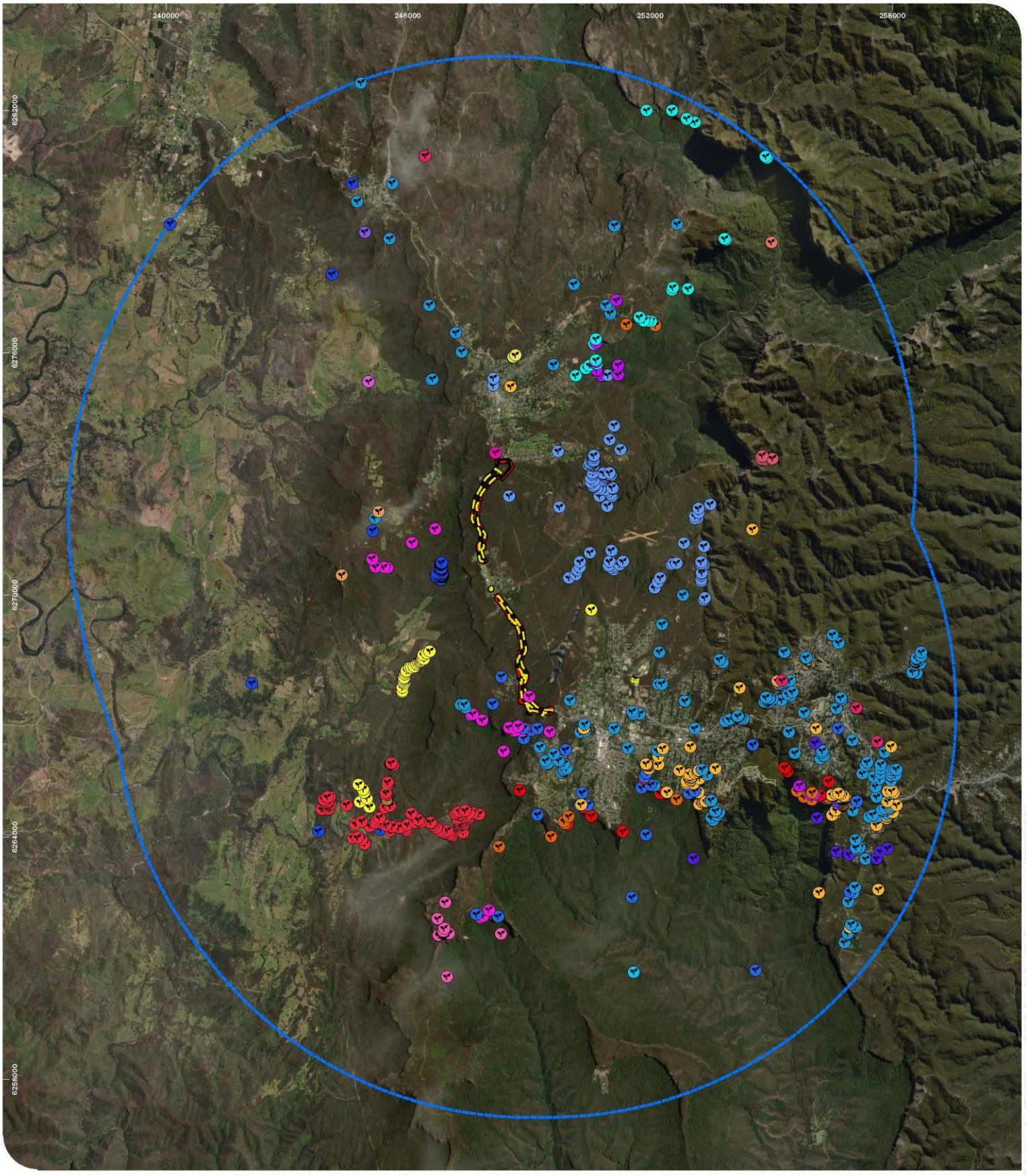
Niche PM: Amanda Griffith
Niche Proj. #: 6171
Client: Aurecon

Threatened species recorded
Great Western Highway Upgrade - BAR

Figure 3-1



Proposed Area
10km buffer
REF proposal area
revised proposal area
Acacia baueri subsp. aspera
Acacia bynoeana
Acacia clunies-rossiae
Acacia flocktoniae
Acrophyllum australe
Callistemon megalongensis
Callistemon purpurascens
Carex klaphakei
Epacris hamiltonii
Euphrasia bowdeniae
Isopogon fletcheri
Kunzea cambagei
Leionema lachnaeoides
Lepidosperma evansianum
Leucopogon exolasius
Persoonia acerosa
Pherosphaera fitzgeraldii
Pultenaea glabra
Velleia perfoliata
Veronica blakelyi
Xanthosia scopulicola
Zieria covenyi
Zieria involucrata

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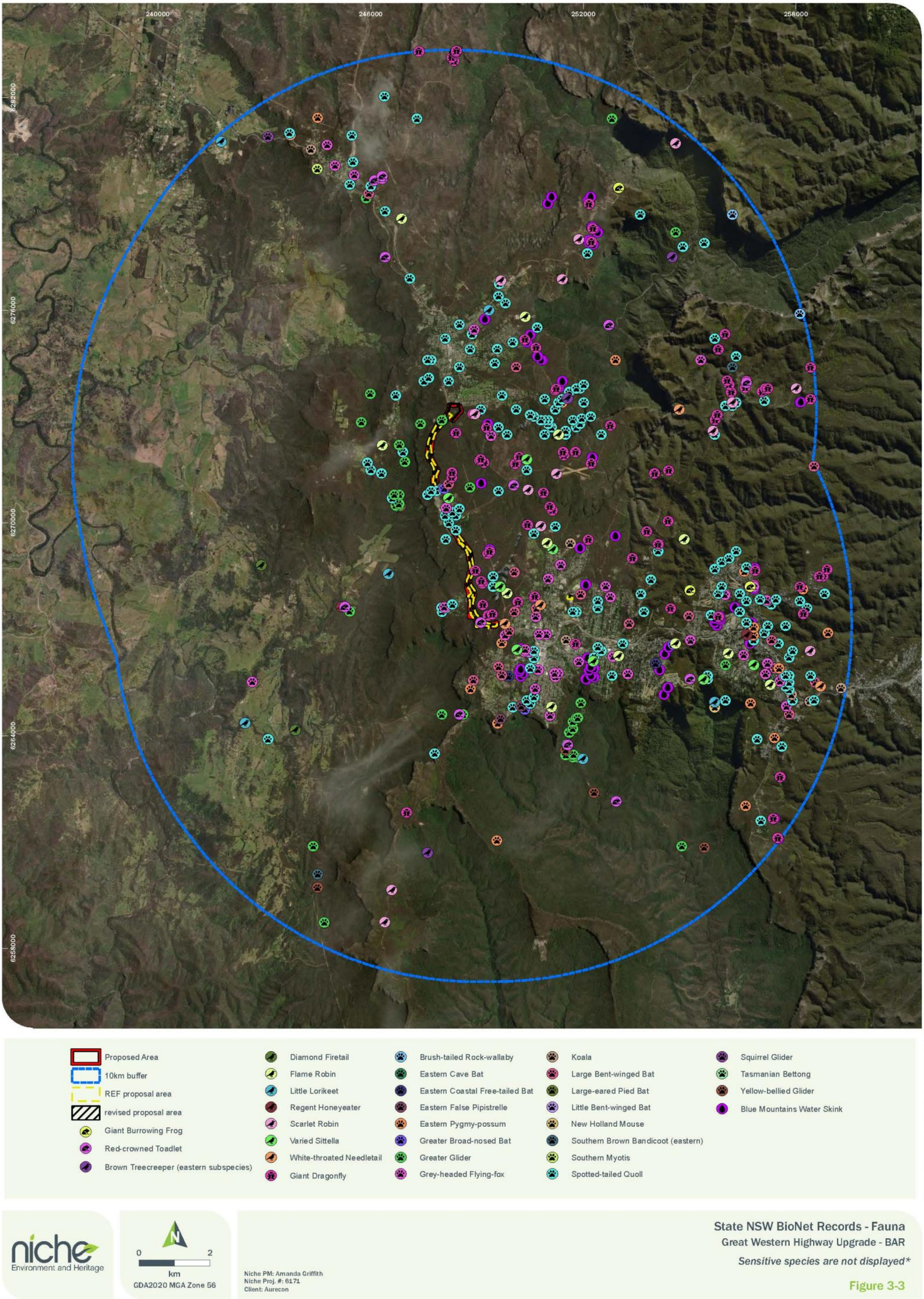
Niche PM: Amanda Griffith
Niche Proj. #: 6171
Client: Aurecon

State NSW BioNet Records - Flora
Great Western Highway Upgrade - BAR
*Sensitive species are not displayed**

Figure 3-2



Niche PM: Amanda Griffith
Niche Proj. #: 6171
Client: Aurecon

State NSW BioNet Records - Fauna

Great Western Highway Upgrade - BAR

*Sensitive species are not displayed**

Figure 3-3

4 Avoidance and mitigation

In accordance with the BAM, proponents must demonstrate the measures employed to avoid, mitigate, and offset impacts of a proposal on biodiversity values. This section of the report outlines the details from the REF associated with avoidance, planning, management, and mitigation measures that TfNSW has incorporated into the proposal design or would employ during construction or operation of the proposal to reduce impacts on biodiversity values.

Detailed measures that will be employed to manage and mitigate potential impacts of the proposal are provided in Section 6.

4.1 Justification for the Project

The NSW State Government and the Australian Federal Government aim to improve freight efficiency to the Central West, reduce travel times and improve safety for all road users through significant upgrades to a 34 kilometres long section of the Great Western Highway between Katoomba and Lithgow (the Great Western Highway Upgrade Project). The NSW Government has progressively upgraded various sections of the Great Western Highway to make it safer and more reliable for all road users. The Great Western Highway Upgrade Project is being progressed and delivered in four stages:

- East Upgrade – Katoomba to Medlow Bath and Medlow Bath to Blackheath
- Medlow Bath Upgrade
- Central Upgrade – Blackheath to Little Hartley.
- West Upgrade – Little Hartley to Lithgow

The proposal constitutes the East Upgrade, including about 5.3 kilometres of the Great Western Highway between Katoomba to Medlow Bath and Medlow Bath to Blackheath to a four-lane divided road, with duplication and widening works, inclusive of bridges and connection (the study area).

The process of completing this BAR supports the planning and design development of the proposal including identifying environmental risks, constraints and areas of sensitivity and making recommendations for the avoidance or minimisation of potential impacts to biodiversity.

4.2 Design refinements

As part of the options development for the upgrade of the Great Western Highway from north of Katoomba to Forty Bends in 2018, environmental and engineering constraints were identified. These included:

- Areas of Blue Mountain Swamp TEC within proximity to the REF proposal area for the Great Western Highway East Upgrade
- Increased inhibition in fauna connectivity across the landscape
- A constrained corridor due to steep topography, the existing Main Western Railway and the proximity of the Blue Mountains National Park and Blue Mountains World Heritage Area.
- Requirement for major horizontal alignment improvements between Katoomba and Medlow Bath to achieve the nominated design speed of 90 kilometres per hour.
- Need for substantial cuts and high retaining walls between Katoomba and Medlow Bath.
- Need to ensure continued traffic flow during construction, which would require construction staging and complex traffic switches on some parts of the alignment.
- Interaction with the rail corridor in the southern and northern parts of Blackheath.
- Opportunity to improve urban amenity (and protect heritage values) within Blackheath with a bypass of the main township which sits to the east of the railway.
- Presence of underground and above ground public utilities, particularly through Blackheath.
- Need for tunnels, bridges and deep fills for alignments to the west of Blackheath and associated challenges for construction access.
- Need to implement water quality controls within a constrained corridor to ensure a neutral or beneficial effect on water quality within drinking water catchments.

While design refinement opportunities were limited between Katoomba and Medlow Bath, the following design refinements were achieved for the purpose of biodiversity avoidance and mitigation:

- A design workshop was conducted in August 2021, to identify areas where fauna sensitive road design options would be achievable. As a result, it is proposed that Glider Poles could be installed in the vicinity of Pulpit Hill.
- A design workshop was held in September 2021, in an effort to avoid direct impacts to an identified patch of Blue Mountains Swamp (swamp) TEC. The Swamp, about 1.15 hectares in size occurs to the west of the existing highway in the south of the REF proposal area to the north of Pulpit Hill. About 0.12 hectares will be indirectly impacted by the REF proposal area. The patch of swamp is located beneath the proposed bridge near Pulpit Hill. During the design process, one of the sets of bridge piers was located within the eastern-most extent of the swamp. In order to avoid direct impacts to the swamp, the bridge design was amended such that the eastern-most extent of the swamp would fall in the middle of the span between two piers, to maximise the distance between the swamp and the bridge piers. As such, the bridge piers (and access track for construction works) will avoid directly impacting on the swamp. There will be a buffer area of at least 5 metres between the construction area and margin of the swamp. The piers will be excavated and constructed from the ground, but the bridge deck will be pushed across the valley from south to north across the piers.

4.3 Eastern Pygmy-possum population survey and monitoring

The Eastern Pygmy-possum was recorded at seven different locations on either side of the existing highway during targeted survey. At each location, images of Eastern Pygmy-possums were recorded more than once, with the exception of RC18 where the species was only recorded on one occasion. The impact assessment (detailed below) indicates there is the potential for significant impacts to the local population. As such, it is proposed that a survey and monitoring program (including the installation of nest boxes within and outside the REF proposal area) be developed to better understand the size/extent of the local population(s). This information will assist in determining the significance of impacts, while also providing suitable compensatory and supplementary nesting habitat for the species to mitigate impacts of the proposal.

5 Impact assessment

5.1 Removal of native vegetation

5.1.1 Direct impacts on native vegetation and habitat

The proposal will result in the removal of up to 50.01 hectares of native vegetation, as shown in Table 5-1. Up to 220 hollow-bearing trees have the potential to be impacted. The values are considered to represent upper limits and would be reduced wherever possible and practical during further project design and construction processes. Potential impacts of the proposal on listed biodiversity are discussed below.

Table 5-1: Direct impacts to native vegetation

Vegetation zone	Status (BC Act)	Area to be impacted in proposed REF proposal area (ha)	Number of hollow bearing trees impacted in the REF proposal area	Area to be impacted in the revised proposal area (ha)	Total area to be impacted (ha)	Number of hollow bearing trees impacted in the revised proposal area
1248_Moderate	Not listed	27.74	165	1.63	29.32	10
1248_Low	Not listed	19.06	41	0.82	19.88	3
1248_Degraded	Not listed	0	0	0	0	0
967_Moderate	Not listed	0.70	1	0	0.70	0
967_Low	Not listed	0.06	0	0	0.06	0
PCT_1078	Listed	0	0	0 (avoidance 0.06 ha of TEC)	0	0
Total	**-**	**47.56**	**207**	**2.45**	**50.01**	**13**

5.1.2 Indirect impacts on native vegetation and habitat

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities, and threatened species habitat beyond the REF proposal area and revised proposal area.

A range of indirect impacts are likely to or could occur as a result of the proposal, including:

- increased noise, dust and light from the construction and operational activities
- loss of connectivity and fragmentation of habitats at a regional scale through clearing of native vegetation within the proposal area
- erosion or sedimentation in areas adjoining construction and operational activities
- increased spreading of weed propagules
- increased edge-effects for surrounding vegetated areas.

Such impacts may be greater during the construction phase but are likely to remain throughout the operational phase of the proposal. These indirect impacts will be minimised through management procedures and processes during both construction and operation (detailed in Section 5).

The indirect impacts described above are variable in terms of the distance they may extend from the proposal area, and in many cases, due to mitigation measures, indirect impacts would be completely contained within the REF proposal area and revised proposal area.

The area of indirect impact without mitigation measures has been defined as a 50-metre area around the perimeter of the REF proposal area and revised proposal area , which is consistent with the TfNSW indirect impact guidelines (TfNSW 2021) (Figure 2-1). This buffer would likely

encapsulate the potential spread of weeds, edge effects in surrounding vegetated areas, erosion, dust, intensive light spill, and sedimentation during construction and operation.

Within the 50-metre indirect impact buffer area, there is about 68.80 hectares of native vegetation that is of a similar condition to that of the proposal area i.e. scattered patches of native vegetation subject to edge effects and weed incursion. The operation of the proposal would result in edge effects in already largely fragmented native vegetation within the indirect impact buffer area.

Blue Mountains National Park is located adjacent to the proposal area and would likely be subject to indirect impacts as described above. The proposal area sits at the top of the water catchment area with a number of the ephemeral waterways on the eastern side of the existing highway ultimately flowing into Lake Medlow which forms part of the Sydney Water Drinking Catchment. Measures to minimise the likelihood of indirect impacts to sensitive receiving environments from the proposal are detailed in Sections 4 and 6.

The Blue Mountains Swamp TEC is likely to be subject to indirect impacts from the proposal. The potential indirect impact buffer area may be expected to extend 50 metres from the construction footprint. As such, the proposal has the potential to modify 0.12 hectares of the 1.16-hectare patch. Indirect impacts to the swamp will be managed and mitigated via implementation of a range of targeted actions (such as protective and sediment fencing around the perimeter of the swamp during construction). It is proposed that regular monitoring of the Swamp (to identify and remediate any impacts) also be conducted during construction and into operation and included in the Flora and Fauna Management Plan for the proposal.

The specific indirect impacts and how they relate to the ecology of the REF proposal area and revised proposal area, along with corresponding mitigation measures are discussed in detail in Table 6-1.

The area associated with indirect impacts on the PCTs and associated habitat surrounding the proposal area is detailed in Table 5-2. Mitigation measures to minimise identified impacts, are discussed in Section 5.

Table 5-2: Area of potential indirect impact

PCT	TEC	Condition identified (used in BAM-C)	Direct impact (ha)	Indirect impact (ha)
1248	Does not align to any listed TECs	Degraded, Low, Moderate	49.20	17.93
967	Does not align to any listed TECs	Low and Moderate	0.76	0.2
1078	Aligns with TEC	Moderate	0 (avoidance 0.06 ha of TEC)	0.12
Total			**50.01**	**18.25**

5.1.3 Impacts to threatened species

The proposal would require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. It will also result in the removal of up to 220 hollow-bearing trees, a critical breeding and shelter resource for many threatened biodiversity. The native vegetation to be removed is of variable condition (low to moderate, having been subject to historical clearing and edge effects) but supports potential habitat (including foraging, shelter and breeding resources) for native flora and fauna.

The proposal has the potential to impact the following biodiversity: one TEC, three threatened flora species and 26 threatened species of fauna. A summary of the presence, habitat and potential impact to each of the threatened entities is provided below. Section 5.1.3 provides a summary of the species with known or potential habitat within the study area and the nature of potential impacts. Table 5-3 provides a summary of the species and area/extent of impact.

Detailed assessment of the extent of impact on each of these threatened entities is presented with the assessment of significance in Annexure D (for BC Act listed species) and Annexure E (for EPBC Act listed species). The results and summary of the assessments of significance is presented in Section 5.4.

It is proposed that a Flora and Fauna Management Plan (FFMP) be developed to mitigate and manage all impacts to threatened biodiversity described below.

5.1.3.1 Blue Mountains Swamp in the Sydney Basin Bioregion TEC

A patch of Blue Mountains Swamp (swamp) was confirmed within the study area and is at least 1.16 hectares in size, likely extending even further to the west along the drainage line. About 0.71 hectares occurs within the study area and is located immediately adjacent to the west of the REF proposal area. The REF proposal area in this location includes the area required for construction and placement of the bridge piers as well as a construction vehicle access track.

The patch of swamp is located beneath the proposed bridge near Pulpit Hill. During the design process, one of the sets of bridge piers was located within the eastern-most extent of the swamp. To avoid direct impacts to the swamp, the bridge design was amended such that the eastern-most extent of the swamp would fall in the middle of the span between two piers, to maximise the distance between the swamp and the bridge piers. As such, the bridge piers (and access track for construction works) will avoid directly impacting on the swamp. There will be a buffer area of at least five metres between the construction area for the pier and the edge of the swamp. The piers will be excavated and constructed from the ground, but the bridge deck will be pushed across the valley from south to north across the piers to avoid ground impacts.

Two water detention basins will be located upslope, to the north-east and south-east of the swamp to collect water run-off from the bridge deck at either end of the bridge. The basins comprise a two-stage water processing system, designed to maximise quality of water to be discharged into surrounding environment. The two onsite detention basins have been designed to exceed the TfNSW water sensitive urban design guidelines and would result in a positive NorBE (Neutral or beneficial effect) water quality outcome (TfNSW 2017). As such it is unlikely that run-off from the detention basin will negatively impact the swamp habitat.

Any water release would occur over a large area as sheet flow across the hillslope to avoid the potential for erosion and sedimentation in sensitive receiving environments.

Assuming an indirect impact area of 50 metres from the edge of construction works and considering the five-metre buffer; indirect impacts may occur within 45 metres of the edge of the Swamp. As such, about 0.12 hectares of swamp habitat may be indirectly impacted by the proposal. Excavation for the bridge piers upslope of the Swamp may also have impacts to underground hydrology on which the Swamps may depend.

Impacts to the swamp will be managed and mitigated via implementation of a range of targeted actions (such as protective and sediment fencing around the perimeter of the swamp during construction).

It is proposed that regular monitoring of the Swamp (to identify and remediate any impacts) also be conducted during construction and into operation and included in the FFMP for the proposal (Section 6).

5.1.3.2 Needle Geebung *(Persoonia acerosa)*

One Needle Geebung individual was recorded within the REF proposal area during pre-clearing surveys for geotechnical investigations as part of the broader project.

The closest records of the species include three individuals located two kilometres to the south-west of the study area in the Megalong Valley. The individual within the study area is likely to represent a separate subpopulation to those in the Megalong Valley due to geographical/topographical separation of the individuals and limitation of cross-pollinating opportunities by bees. Other records within three kilometres of the species to the south and east, and of similar altitude, may constitute the same population, dependant on the pollination requirements of the species. However, as per the threatened species Test of Significance guidelines (OEH (2018), the local population of a threatened plant species comprises those individuals

occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.

Given only one individual was located within the study area (and the surrounding area up to 100 metres from the individual was surveyed), the local population is considered to consist of one individual.

There are at least 250 records of the species within the locality. The species is known from the Blue Mountains National Park, one historical record from Kanangra-Boyd National Park and areas managed by Blue Mountains City Council at Woodford Dam, a reserve at Leura, Adelina Falls at Lawson, and Hassans Walls Reserve at Lithgow. Some sites are known to support many individuals (up to 40 plants over a few hundred metres in some locations).

Potential impacts from the proposal to this individual include loss of habitat through vegetation clearing, weed incursion, and indirect habitat disturbance.

The Proposal will result in the removal of one individual representing a small local population. This population is considered unlikely to be important to the long-term survival of the species and therefore a significant impact to the species is considered unlikely. Seed collection will be undertaken in an effort to aid in re-establishment of individuals as part of revegetation works for the proposal (Section 5).

5.1.3.3 Superb Midge Orchid (*Genoplesium superbum*)

The BioNet Atlas has no records of the Superb Midge Orchid within the locality (10-kilometre radius). Based on the lack of records within the locality, sub-optimal habitat and the fact that none were recorded during targeted survey, it is considered unlikely to occur within the REF proposal area and revised proposal area.

Impacts to potential habitat will be managed in accordance with the recommendations outlined in Section 5 and further developed in the FFMP.

5.1.3.4 Klaphake's sedge (*Carex klaphakei*)

The BioNet Atlas has five records within the locality (10-kilometre radius). Targeted surveys were conducted for this species in September 20212021; however, no individuals were identified.

The only potentially suitable habitat for Klaphake's sedge within the study area, consists of a patch of Blue Mountains Swamp (swamp) that is at least 1.16 hectares in size and occurs to the west of the existing highway in the south near Pulpit Hill. About 0.71 hectares occurs within the study area, and 0.12 hectares occurs within the REF proposal area (within the 50-metre indirect impact buffer).

Indirect impacts to the swamp (and potential Klaphake's sedge habitat) will be managed and mitigated via implementation of a range of targeted actions (such as protective and sediment fencing around the perimeter of the swamp during construction).

5.1.3.5 Koala (*Phascolarctos cinereus*)

According to BioNet Atlas, Koala has nine records within the locality (10-kilometre radius). Two of those records are located about 9.5 kilometre to the north of the REF proposal area along the Great Western Highway (from 2004 and 2020), while the remaining six occur to the east in the Blackheath/Leura area (recorded in 2006, 2013 and 2015). No physical presence of Koalas was observed during targeted surveys.

The study area contains some Koala use tree species as listed under the SEPP (Koala Habitat Protection) 2021 for the Central and Southern Tableland's Koala Management Area, including, the dominant Silvertop Ash (*Eucalyptus sieberi*) and Sydney Peppermint (*Eucalyptus piperita*). In addition, for the Central and Southern Tablelands, Ribbon Gum (*Eucalyptus viminalis*; Primary food tree) and Brittle Gum (*Eucalyptus mannifera*; secondary food tree) were identified in low densities in the eastern portion of the proposal footprint (DECC 2008).

The native vegetation to be removed (50.01 hectares) likely represent secondary Koala habitat (as per DECC 2008) given the low number of previous records within proximity and low numbers of primary food trees present. Secondary habitat is defined as "Primary food tree species absent, habitat comprised of secondary and supplementary food tree species only. Capable of supporting viable, low-density

populations (< 0.10 koala/ha)" (DECC 2008). The habitat to be removed within the study area likely represent foraging and sheltering habitat for the species.

Furthermore, the proposal will further fragment moderate to highly connected woodland and forest habitat types located next to the existing Great Western Highway and also has the potential to increase the risk of injury or death from trampling during construction or from vehicle strike post-construction.

Impacts to connectivity and fragmentation will be managed in accordance with the recommendations outlined in Section 5 and further developed in the FFMP.

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

The BioNet Atlas has 11 records within the locality (10-kilometre radius). The species was not recorded within the REF proposal area during acoustic surveys in Spring 2020 and Summer 2021.

In accordance with the BAM 2020 and 'Species credit' threatened bats and their habitats (DPIE 2018), the proposal will be removing up to 50.01 hectares of potential Large-eared Pied Bat foraging habitat (native vegetation), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. The vegetation to be removed represents potential foraging habitat for the species.

The proposal will not impact any breeding/roosting habitat for the species in the form of karst environments, overhangs, fissures and crevices in the escarpment to east of the REF proposal area.

5.1.3.7 Blue Mountains Water Skink (*Eulamprus leuraensis*)

85 records within the locality (10-kilometre radius). No individuals were recorded within the patch of Blue Mountains Swamp (swamp).The proposal has been designed to avoid direct impacts to the area of potential habitat for these species and there will be a buffer area of at least five metres between the construction boundary around the bridge pier and margin of the swamp. The piers will be excavated and constructed from the ground, but the bridge deck will be pushed across the valley from south to north across the piers.

Indirect impacts to the swamp will be managed and mitigated via implementation of a range of targeted actions (such as protective and sediment fencing around the perimeter of the swamp during construction). Therefore, impacts to the species are considered unlikely.

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

There are 92 BioNet Atlas records of the species within the locality (10-kilometre radius). Targeted surveys for the species have not been conducted. However, no established camps or incidental sightings have been identified during field campaigns. The closest know camp site occurs at Emu Plains (approximately 35 kilometres east of the proposal, DAWE 2015). Given the nomadic nature of the species, it is likely that the species utilises the foraging resources in the study area opportunistically at certain times of the year.

The proposal will remove 50.01 hectares of potential Grey-headed Flying-fox foraging habitat (native vegetation), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway.

5.1.3.9 Gang-gang Cockatoo (*Callocephalon fimbriatum*)

The BioNet Atlas has 54 records within the locality (10-kilometre radius). The species was identified flying above the canopy in the REF proposal area during spring 2020 surveys and Summer 2021 surveys.

Dusk stagwatching of potential nest hollows (December 2021) confirmed the absence of breeding individuals within the REF proposal area. However, the species was identified foraging in the study area during Summer 2021 and during diurnal field surveys (flying above the canopy) and in the broader study area during Spring 2020 diurnal surveys. It is possible it is using nesting resources outside of the REF proposal area and revised proposal area for breeding.

The proposal will require the removal of up to 50.01 hectares of native vegetation, which is confirmed foraging habitat for the species.

Direct impacts to potential foraging habitat will be managed and mitigated via implementation of stringent mitigation measures (e.g. implementation of pre-clearing protocols and a nest box/habitat replacement strategy) in the FFMP (Section 6).

5.1.3.10 Spotted-tailed Quoll (*Dasyurus maculatus*)

The BioNet Atlas has 190 records within the locality (10-kilometre radius). No quolls were recorded during surveys and camera trapping. No den or latrine sites were recorded within the REF proposal area.

The proposal will require the removal of up to 50.01 hectares of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. The vegetation to be removed provides potential habitat for the species. Native vegetation to the north, north-east, west and south-west of the study area is part of a contiguous patch (Blue Mountains National Park and WaterNSW lands). However, portions of the study area have been previously impacted by historical land clearing, agricultural activity and development which has slightly reduced the connectivity.

The increase in road width may result in reduced ability for terrestrial fauna to move safely across the road to access patches of habitat on either side. As such, the proposal may increase the risk of vehicle interactions and fatalities. Impacts to connectivity and fragmentation will be managed in accordance with the recommendations outlined in Section 6 and further developed in the FFMP.

5.1.3.11 Rosenberg's Goanna (*Varanus rosenbergi*)

The BioNet Atlas has no records within the locality (10-kilometre radius). No individuals have been identified to date; however, the species is notoriously cryptic, have large home ranges, habitat within the study area is suitable to support the species and there are several subterranean termite mounds that could potentially support the incubation of Goanna eggs.

The proposal will require the removal of up to 50.01 hectares of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. This vegetation represents potential habitat for the species. Native vegetation to the north, north-east, west and south-west of the study area is part of a contiguous patch (Blue Mountains National Park and WaterNSW lands).

The increase in road width may result in reduced ability for terrestrial fauna to move safely across the road to access patches of habitat on either side. As such, the proposal may increase the risk of vehicle interactions and fatalities. Impacts to connectivity and fragmentation will be managed in accordance with the recommendations outlined in Section 6 and further developed in the FFMP.

5.1.3.12 Eastern Pygmy Possum [*Cercartetus nanus*

According to BioNet Atlas there are 32 Eastern Pygmy-possum records within the locality (10-kilometre radius).

Targeted surveys for the Eastern Pygmy-possum were conducted in December 2021 through to January 2022 and identified the presence of Eastern Pygmy-possum (see Plate 5-1).

The proposal will require the removal of a total of up to 50.01 hectares of native vegetation (confirmed foraging habitat), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. It will also require the removal of up to 220 hollow-bearing trees (potential nesting/breeding resources).

Within the Blue Mountains, the Eastern Pygmy-possum is considered to be widespread but occur in relatively small numbers (pers. comm. Kylie Madden, DPIE, 2021). They were not detected during spotlighting surveys conducted as part of the current assessment (in Winter or Spring 2021) or during preliminary camera trapping conducted in Spring 2020.

A detailed impact assessment for the species is provided in Annexure D. It concluded that there was potential for significant impacts to the local population(s) due to the limited known local population size, and the potential for the proposal to impact on the life cycle of any individual that may occur within the REF proposal area through the direct removal of foraging and nesting resources. In order to avoid, minimise and mitigate impacts to the species, a survey and monitoring program (including installation of nest boxes) will

be developed to better inform the impact assessment while providing supplementary/compensatory nesting habitat.

Impacts to potential nesting and foraging habitat, connectivity and fragmentation will be managed in accordance with the recommendations outlined by the Saving our Species strategy for this species (DPIE 2021d), Section 6 and further developed in the survey and monitoring program for the species.

Plate 5-1 Eastern Pygmy-possum captured on remote camera (RC21)

5.1.3.13 Squirrel Glider [*Petaurus norfolcensis*] and Greater Glider [*Petauroides volans*])

According to BioNet Atlas there is one Squirrel Glider and 70 Greater Glider records within the locality (10-kilometre radius). Targeted surveys for Greater Glider and Squirrel Glider were undertaken and neither species were recorded.

The proposal has the potential to impact the Greater Glider through removal of potential breeding habitat (hollow-bearing trees) and reduction in foraging habitat. Given the size of their home ranges, the area of habitat within the proposal area would likely represent a relatively small portion of habitat for species whose home ranges may overlap the REF proposal area and revised proposal area. Home ranges are typically relatively small (1−4 hectares) but are larger in lower productivity forests and more open woodlands (up to 16 hectares). They are larger for males than for females with male home ranges being largely non-overlapping.

It is unlikely though that Greater Glider are limited to the area being impacted due to the presence of the surrounding vegetation. The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement throughout the region. However, without appropriate mitigation measures, the proposal may impact on the life cycle of any individuals that may occur within the REF proposal area and revised proposal area, through removal of nesting resources and reductions in connectivity.

Given the large area of similar habitat available within the broader area, the Blue Mountains National Park and Water NSW land, and presence of suitable foraging resources within these areas, species mobility and the removal of a relatively small proportion of woodland habitat within the study area is, the proposal is

considered unlikely to have an adverse effect on the foraging resources available to arboreal mammal species.

The mobility of these species increases the likelihood of vehicle strike as the existing highway width increases, particularly in the warmer seasons. The increased distance between the eastern and western sides of the existing highways (from 20 metres to 100 metres) may result in some degree of obstruction of fauna movement along this portion of the Great Western Highway.

As such, the proposal may increase the risk of vehicle interactions and fatalities. Impacts to potential nesting habitat, connectivity and fragmentation will be managed in accordance with the recommendations outlined in Section 6 and further developed in the FFMP.

5.1.3.14 Threatened hollow-dependant bats (Eastern Coastal Free-tailed Bat [*Micronomous norfolkensis*], Yellow-bellied Sheath-tailed Bat [*Saccolaimus flaviventris*], Eastern False Pipistrelle [*Falsistrellus tasmaniensis*], Greater Broad-nosed Bat [*Scoteanax rueppellii*])

According to BioNet Atlas there are four Eastern Coastal Free-tailed Bat, seven Greater Broad-nosed Bat, no Yellow-bellied Sheathtail Bat and 13 Eastern False Pipistrelle records within the locality (10-kilometre radius). During Spring 2020, both Eastern Coastal Free-tailed Bat and Yellow-bellied Sheathtail Bat were acoustically recorded (Figure 3-1).

The proposal will require the removal of up to 50.01 hectares of native vegetation (confirmed foraging habitat), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. It will also require the removal of up to 63 hollow-bearing trees that are considered suitable as potential roosting habitat for these species.

Impacts to potential nesting habitat, connectivity and fragmentation will be managed in accordance with the recommendations outlined in Section 6 and further developed in the FFMP.

5.1.3.15 Threatened cave-dependant bats (Little Bent-winged Bat [*Miniopterus australis*], Large Bent-winged Bat [*Miniopterus orianae oceanensis*], Eastern Cave Bat [*Vespadelus troughtoni*])

According to BioNet Atlas there is one Little Bent-winged Bat, 34 Large Bent-winged Bat and one Eastern Cave Bat records within the locality (10-kilometre radius). During Spring 2020, both Little Bent-winged Bat and Large Bent-winged Bat were acoustically recorded on the eastern side of the highway just north of Medlow Bath (Figure 3-1).

These species tend to roost in caves, but also use derelict mines, storm-water tunnels, buildings, and other man-made structures.

The proposal will not require modification of existing suitable stormwater culverts, small caves, overhangs, crevices and fissures in escarpment within the REF proposal area and revised proposal area. Caves, overhangs, fissures and crevices in escarpment are also likely to be very common in the region.

The proposal will require the removal of up to 50.01 hectares of native vegetation (confirmed foraging habitat), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway.

5.1.3.16 Threatened woodland birds (Brown Treecreeper [eastern subspecies] [*Climacteris picumnus*], Varied Sittella [*Daphoenositta chrysoptera*], Diamond Firetail [*Stagonopleura guttata*], Gilbert's Whistler [*Pachycephala inornate*], Black-chinned Honeyeater [*Melithreptus glumaris gularis*], Little Lorikeet [*Glossopsitta pusilla*])

According to BioNet Atlas there is three Brown Treecreeper (eastern subspecies), 10 Varied Sittella, two Diamond Firetail, no Gilbert's Whistler and eight Little Lorikeet records within the locality (10-kilometre radius). During June and September 2021 surveys, Brown Treecreeper (eastern subspecies) was recorded in northern and mid portion of the study area (Figure 3-1).

The proposal will require the removal of up to 50.01 hectares of native vegetation (comprised of foraging and potential nesting habitat), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway.

Impacts to potential nesting and foraging habitat and connectivity will be managed in accordance with the recommendations outlined in Section 6 and further developed in the FFMP.

5.1.3.17 Threatened woodland robins (Flame Robin [*Petroica phoenicea*], Scarlet Robin [*Petroica boodang*], Hooded Robin [*Melanodryas cucullate*]).

According to BioNet Atlas there were 23 Flame Robin, 24 Scarlet Robin and no Hooded Robin records within the locality (10-kilometre radius). No individuals were identified during field surveys.

The proposal will require the removal of up to 50.01 hectares of native vegetation (comprised of foraging and potential nesting habitat). Impacts to potential nesting and foraging habitat and connectivity will be managed in accordance with the recommendations outlined in Section 6 and further developed in the FFMP.

Table 5-3: Threatened species impacts

Threatened species	Status (BC Act)	Habitat or individuals to be impacted
Needle Geebung (*Persoonia acerosa*)	Vulnerable	1 individual
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Vulnerable	50.01 ha potential foraging habitat
Grey-headed Flying fox (*Pteropus poliocephalus*)	Endangered	50.01 ha potential foraging habitat
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	Vulnerable	50.01 ha confirmed foraging habitat
Spotted-tailed Quoll (*Dasyurus maculatus*)	Vulnerable	50.01 ha potential foraging habitat
Rosenberg's Goanna (*Varanus rosenbergi*)	Vulnerable	50.01 ha potential habitat (foraging, sheltering, breeding)
Superb Midge Orchid (*Genoplesium superbum*)	Endangered	0.76 ha of potential habitat in PCT 967
Klaphake's Sedge (*Carex klaphakei*)	Endangered	Indirect impacts to 0.12 ha of potential habitat
Eastern Pygmy Possum (*Cercartetus nanus*)	Vulnerable	50.01 ha of confirmed habitat, and up to 220 hollow-bearing trees (which may provide potential nesting/breeding resources)
Squirrel Glider (*Petaurus norfolcensis*)	Vulnerable	50.01 ha of potential foraging habitat, and up to 207 hollow-bearing trees (which may provide potential nesting/breeding resources)
Greater Glider (*Petauroides volans*)	-	50.01 ha of potential foraging habitat, and up to 207 hollow-bearing trees (which may provide potential nesting/breeding resources)
Eastern Coastal Free-tailed Bat (*Micronomous norfolkensis*)	Vulnerable	50.01 ha confirmed foraging habitat and 63 hollow-bearing trees that are considered suitable as potential roosting habitat for these species.
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	Vulnerable	50.01 ha confirmed foraging habitat and 63 hollow-bearing trees that are considered suitable as potential roosting habitat for these species.
Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)	Vulnerable	50.01 ha confirmed foraging habitat and 63 hollow-bearing trees that are considered suitable as potential roosting habitat for these species.

Threatened species	Status (BC Act)	Habitat or individuals to be impacted
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	Vulnerable	50.01 ha potential foraging habitat and 63 hollow-bearing trees that are considered suitable as potential roosting habitat for these species.
Little Bent-winged Bat (*Miniopterus australis*)	Vulnerable	50.01 ha of confirmed foraging habitat
Large Bent-winged Bat (*Miniopterus orianae oceanensis*)	Vulnerable	50.01 ha of confirmed foraging habitat
Eastern Cave Bat (*Vespadelus troughtoni*)	Vulnerable	50.01 ha of potential foraging habitat
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus*)	Vulnerable	50.01 ha of confirmed foraging habitat and removal of potential nesting habitat (up to 220 hollow-bearing trees to be removed)
Varied Sittella (*Daphoenositta chrysoptera*)	Vulnerable	50.01 ha of potential foraging habitat and indirect removal of potential nesting habitat (e.g., cup-nests)
Diamond Firetail (*Stagonopleura guttata*)	Vulnerable	50.01 ha of potential foraging habitat and indirect removal of potential nesting habitat (e.g., cup-nests)
Gilbert's Whistler (*Pachycephala inornate*)	Vulnerable	50.01 ha of potential foraging habitat and indirect removal of potential nesting habitat (e.g., cup-nests)
Black-chinned Honeyeater (*Melithreptus glumaris gularis*)	Vulnerable	50.01 ha of potential foraging habitat and indirect removal of potential nesting habitat (e.g., cup-nests)
Little Lorikeet (*Glossopsitta pusilla*)	Vulnerable	50.01 ha of potential foraging habitat and removal of potential nesting habitat (up to 220 hollow-bearing trees to be removed)
Flame Robin (*Petroica phoenicea*)	Vulnerable	50.01 ha of potential foraging habitat and indirect removal of potential nesting habitat (e.g., cup-nests, sheltered sites and shallow tree cavities)
Scarlet Robin (*Petroica boodang*)	Vulnerable	50.01 ha of potential foraging habitat and indirect removal of potential nesting habitat (e.g., cup-nests)
Hooded Robin (*Melanodryas cucullate*)	Vulnerable	50.01 ha of potential foraging habitat and indirect removal of potential nesting habitat (e.g., cup-nests)
Blue Mountains Swamp in the Sydney Basin Bioregion TEC	Vulnerable	Indirect impacts to 0.12 ha of confirmed habitat

5.1.4 Aquatic impacts

Given the absence of aquatic habitats, threatened aquatic species, populations, and communities within the study area no further consideration is required under Section 5a of the EP&A Act.

5.1.5 Injury and mortality

The REF proposal area generally occurs within a connected landscape with large extents of native vegetation on either side of the existing road and rail corridor. Local fauna is currently exposed to vehicle strike through existing operation of the road, and thus to a certain extent, may be habituated to the road (through avoidance or calculated/learned risk taking). However, the increase from two to four lanes will result in an increased crossing distance and increased volume of traffic, which may increase the risk of harm/death to local fauna movements. Threatened fauna most at risk include terrestrial species such as Koala, Eastern Pygmy-possum, Spotted-tailed Quoll and the Greater Glider. In relation to the Greater Glider, Koala and Eastern Pygmy-possum, there are very few records for these species in close proximity to the existing road, suggesting they are not readily encountered near/on the road. There are quite a few records of the Spotted-tailed Quoll within close proximity to the road, particularly around the Medlow Bath area. The potential risk associated with road is discussed in further detail in

Table 5-4 with potential mitigation measures included in Section 6.

5.2 Indirect/operational impacts

5.2.1 Wildlife connectivity and habitat fragmentation

The proposal would result in the removal of native vegetation along the existing Great Western Highway corridor (referred to as the REF proposal area) (Figure 1-2). The removal of native vegetation and duplication of the road from two to four lanes would result in an increased distance between patches of native vegetation on the east and west of the Great Western Highway (see Figure 2-1). The distance separating the areas of native vegetation on the eastern and western sides of the existing Great Western Highway is variable along its length, however, is currently an average width about 20 to 30 metres. The proposal would result in an increase in the distance between the two areas to about 100 metres. The potential impacts to this corridor are discussed below and in

Table **5-4**.

The increase in distance between the patches on either side of the existing road is unlikely to impact the lifecycle of mobile species (such as microbats, megabats and birds). However, four fauna species, either recorded during the current assessment or with previous records in the locality, were identified as having the potential to be affected by the proposal through impacts to habitat connectivity/fragmentation: Koala, Spotted-tailed Quoll, Greater Glider and Eastern Pygmy-possum.

A design workshop was held in August 2021, to identify areas where fauna sensitive road design options may be achievable. It was determined that, due to significant geological and topographical constraints, there is no opportunity to provide fauna connectivity structures such as box culverts (or the like) beneath the road for threatened terrestrial species (such as Koala, Spotted-tailed Quoll and Eastern Pygmy-possum) and there is only limited opportunity to provide fauna connectivity structures such as glider poles for arboreal species (namely Greater Glider). One location, in the vicinity of Pulpit Hill in the south of the REF proposal area was identified as a potentially suitable location for glider poles. However, there are no previous records of the species within habitat on either side of the highway in the vicinity of this location. There are no records for this species on the eastern or western side of the road within the Katoomba to Medlow Bath section of the proposal. There are a few records within the vicinity of the northern section of the proposal (the majority of records are off the escarpment to the south and west of the proposal). As mentioned in Table 5-4, it is possible that the patches of fauna habitat on either side of the road have already been effectively isolated for many years due to the existing road, rail line and barriers such as fences. As such, it is recommended that roadkill monitoring be conducted throughout construction and into operation and incorporated into the FFMP to determine whether mitigation measures for connectivity may be required for the Greater Glider.

There are relatively high number of records of the Spotted-tailed Quoll on either side of the road in close proximity to the proposal in the Medlow Bath area. Given the current fragmentation of the habitat and barrier effect of the road, and the difficulties around installation of potentially suitable crossing structures, it is considered that monitoring of roadkill is warranted to determine if mitigation may be required.

Given the small home range of the Eastern Pygmy-possum it is considered likely that the current road already prevents a barrier to movement for the species and that the species would be unlikely to cross due to lack of continuous cover/habitat. There are very few Koala records within the vicinity of the road, and therefore the road widening and effect of fragmentation on the species is likely to be minimal. Again, monitoring of roadkill would ensure any indirect impacts to threatened species may be mitigated where required.

Measures to mitigate the potential impact of habitat fragmentation is discussed further in Section 6.

Table 5-4: Potential impacts associated with loss of connectivity

Species	Areas of connectivity	Movement patterns key to the life cycle of the species	Nature, extent and duration of short and long-term impacts to connectivity	Importance of the area of connectivity within the bioregion and to the lifecycle of the species	Consequences of the impacts for the local and bioregional persistence
Terrestrial and arboreal fauna	The distance separating the areas of native vegetation on the eastern and western sides of the existing Great Western Highway is variable along its length, however, is currently an average width about 20 to 30 metres. The proposal would result in an increase in the distance between the two areas to about 100 metres.	The increased distance between the two patches (from 20 metres to 100 metres) may result in some degree of obstruction of fauna movement along this portion of the Great Western Highway. Existing patches either side of the existing highway are greater than 100 ha in size. The existing highway is subject to high volumes of vehicle traffic and currently supports many obstructions to fauna movement (e.g. rail corridor, fencing, and buildings). It is possible that the patches of fauna habitat on either side have been effectively isolated for some time due to existing road, rail line and barriers such as fences. However, the ability for gliding and terrestrial fauna to safely cross the road will become constrained with the increase in distance; it will increase the risk of vehicle strike and it may represent a barrier for gliding species. No threatened glider species have been recorded within the REF proposal area, nor the revised proposal area, but there are previous records for the Greater Glider within close proximity of the proposal area and on both sides of the road (Figure 2-1).The Spotted-tailed Quoll, for which there are many records in proximity to the road, may also be affected. There are relatively high number of records of the Spotted-tailed Quoll on either side of the	Permanent increase in distance between two large patches of native vegetation either side of the Great Western Highway.	The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement throughout the region. The increase in distance between the patches on either side of the existing road is unlikely to impact the lifecycle of mobile species (such as microbats, megabats and birds). The barrier may result in reduced ability for terrestrial fauna (including threatened fauna such as Spotted-tailed Quoll, Koala) to move safely across the road to access patches of habitat on either side. There are numerous records of the Spotted-tailed Quoll within and adjacent to the proposal area.	It is possible that the patches of fauna habitat on either side of the existing road/rail corridor have been effectively isolated for some time due to the existing road, rail line and barriers such as fences. However, widening the road has the potential to present a barrier to fauna movement and dispersal/access to mates; as well as reducing the habitat available.

Species	Areas of connectivity	Movement patterns key to the life cycle of the species	Nature, extent and duration of short and long-term impacts to connectivity	Importance of the area of connectivity within the bioregion and to the lifecycle of the species	Consequences of the impacts for the local and bioregional persistence
		road in close proximity to the proposal in the Medlow Bath area. Given the small home range of the Eastern Pygmy-possum it is considered likely that the current road already prevents a barrier to movement for the species and that the species would be unlikely to cross due to lack of continuous cover/habitat. There are very few Koala records within the vicinity of the road, and therefore the road widening and effect of fragmentation on the species is likely to be minimal.			

5.2.2 Edge effects on adjacent native vegetation and habitat

The indirect impacts described above are variable in terms of the distance they may extend from the study area, and in many cases, due to mitigation measures, indirect impacts may be completely contained within the study area.

The 50-metre indirect impact buffer around the perimeter of the revised proposal area, is consistent with the TfNSW indirect impact guidelines (TfNSW 2021) (Figure 2-1). This buffer would likely encapsulate the potential spread of weeds, edge effects in surrounding vegetated areas, erosion, dust, intensive light spill, and sedimentation during construction and operation.

Within the 50-metre indirect impact buffer area, there is about 68.80 hectares of native vegetation that is of a similar condition to that of the study area i.e. scattered patches of native vegetation subject to edge effects and weed incursion. The operation of the proposal would result in edge effects in already fragmented native vegetation within the indirect impact buffer area.

Blue Mountains National Park is located adjacent to the study area and will likely be subject to indirect impacts as described above. The study area sits at the top of the water catchment area with a number of the ephemeral waterways on the eastern side of the existing highway ultimately flowing into Lake Medlow which forms part of the Sydney Water Drinking Catchment. Measures to minimise the likelihood of indirect impacts to sensitive receiving environments as a result of the proposal are detailed in Section 6.

5.2.3 Invasion and spread of weeds

The weed species commonly found across the study area included: *Taraxacum officinale* (Dandelion), *Sonchus oleraceus* (Common Sowthistle), *Eragrostis curvula* (African Lovegrass), and *Senecio madagascariensis* (Fireweed). Weeds that were recorded throughout the BAM plots collected that are regarded as ‘High Threat Weeds’, include the following: *Ligustrum sinense* (Small-leaved privet), *Rubus fruticosus* sp. *agg.* (Blackberry), *Bidens pilosa* (Cobblers pegs), and *Juncus acutus*.

Appropriate hygiene protocols will be developed to avoid further encroachment of invasive weeds from the proposal.

5.2.4 Invasion and spread of pests

The proposal is not likely to increase the presence of domestic or feral animals in the local area.

5.2.5 Invasion and spread of pathogens and disease

Areas throughout Blue Mountains National Park (3.5 kilometres of the REF proposal area) have tested positive to *Phytophthora cinnamomi* (Phytophthora).

Recommendations have been made to mitigate the spread of Phytophthora.

5.2.6 Changes to hydrology

Potential impacts of the proposal on hydrology that may affect biodiversity is discussed below.

Table 5-5: Potential impacts to water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

Species or ecological communities	Waterbodies impacted	Nature, extent and duration of short and long-term impacts on water quality and hydrological process	Nature, extent and duration of short and long-term impacts on habitat and life cycle	Importance within the bioregion of the waterbody or hydrological process	Consequences of the impacts for the local and bioregional persistence
PCTs and associated fauna habitat that occur adjacent to first order streams	The proposal area includes five first order tributaries; Megalong Creek, Back Creek, Relton Creek, Greaves Creek, Adams Creek.	The proposal may result in physical impacts to the first order creeks that occur within the proposal area due to construction and installation of the road as well as installation of culverts/drainage works and trenches. The construction and on-going operation of the road has the potential to result in an increase in pollutants from surface water runoff. Surface water impacts will be mitigated, in accordance with the TfNSW WSUD guidelines (TfNSW 2017), through the use of detention basins which are purposefully designed to enhance water quality, coupled with long-term monitoring of the adjacent upland swamp area. Detailed mitigation measures ae provided in Section 6.	Altered hydrology has the potential to affect sensitive receiving environments such as the Blue Mountains Swamp located within and adjacent to the proposal area, Blue Mountains National Park and the Sydney Water Catchment area. With respect to the Swamp, impacts may include extended periods of drying or waterlogging; weed incursion/increase in weed abundance and changes in floristics and habitat suitability for dependant flora and fauna. Changes may be short-term and/or long-term. Implementation of suitable mitigation and monitoring will ensure effects of the proposal are identified to avoid the potential for long-term impacts.	The first order creeks are ephemeral creeks and soaks. They potentially feed some of the upland and hanging swamps known to occur within the Blue Mountains. Blue Mountains Swamp is a State and Commonwealth listed TEC and therefore considered of regional and national importance.	Moderate – The local impact to first order streams within the proposal area would be relatively low and managed with implementation of proposed mitigation measures. Implementation of mitigation measures and on-going monitoring will also ensure impacts to areas supporting Blue Mountains Swamp, the adjacent Blue Mountains National Park and Sydney Water Catchment Area are avoided. The proposal design and mitigation measures detailed in Section 6 have minimised impacts to watercourses.

5.2.7 Noise, light and vibration

The area of indirect impact without mitigation measures has been defined as a 50-metre area around the perimeter of the REF proposal area, which is consistent with the TfNSW indirect impact guidelines (TfNSW 2021) (Figure 2-1). This buffer would likely encapsulate the potential spread of weeds, edge effects in surrounding vegetated areas, erosion, dust, intensive light spill, and sedimentation during construction and operation.

Noise, light and vibration impacts associated with the construction phase and operation of the proposal will be managed through mitigation measures (Section 6).

Furthermore, ecologically sensitive lighting design should be considered when erecting streetlights (shielding, pointing down and away from the adjacent bushland, reduced lumens etc).

5.2.8 Groundwater dependent ecosystems

According to the Groundwater Dependent Ecosystems Atlas (Bureau of Meteorology 2021b), no potential Groundwater Dependent Ecosystem's (GDEs) occur within the study area.

However, it is known that Blue Mountains Swamps are formed via groundwater that seeps through permeable sandstone layers with perched aquifers being the primary water source (Spencer and Merson 2018). The Swamps are very reliant on groundwater discharge, with some rainfall and surface runoff intersecting perched groundwater aquifers.

Despite the Atlas identifying no GDE's within the study area, it is likely that the PCT associated with Blue Mountains Swamp (PCT 1078 Prickly *Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion*) is reliant on a combination of surface and groundwater flows.

A monitoring program for the Blue Mountains Swamp will be developed and incorporated in the project FFMP for prior, during and post-construction to identify any potential hydrological impacts associated with the construction bridge.

5.3 Cumulative impacts

The potential for cumulative impacts due to the proposal has been considered. Other planned and potential infrastructure developments in the locality include:

- Medlow Bath Upgrade - an upgrade and duplication of the existing surface road corridor with intersection improvements and a new pedestrian bridge (directly adjacent to the current study area).
- Great Western Highway Central Upgrade - Blackheath to Little Hartley: Construction of a tunnel bypass of Blackheath and Mount Victoria, with connectivity between the two proposed tunnels currently under further investigation (directly to the north of M2B).
- Great Western Highway West Upgrade - Little Hartley to Lithgow Upgrade: duplication and widening of the existing surface road corridor, with connections to a tunnel portal at Little Hartley (west of the current study area; 15 kilometres away).

The proposal will increase the amount of native vegetation and habitat removal (about 50.01 ha) within the wider locality.

Threatened biodiversity recorded and impacted by the proposal may also occur within the vicinity of the associated road upgrade projects listed above. As such the proposal has the potential to have cumulative impacts on the affected biodiversity. The extent of direct and indirect impacts for the other projects is unknown at this stage.

5.4 Assessments of significance

A summary of the BC Act and EPBC Act assessments of significance are provided below with each assessment detailed in Annexure D and Annexure E. Unless referenced otherwise, all species information was taken from the relevant State and Commonwealth species profiles:

- NSW Threatened Biodiversity Data Collection (DPIE 2021a)
- NSW Threatened Species Profiles (Office of the Environment and Heritage https://www.environment.nsw.gov.au/threatenedspeciesapp/
- Species Profile and Threats (SPRAT) database for EPBC Act listed threatened species and communities: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

5.4.1 BC Act Test of Significance (ToS) assessments

A total of 25 state listed threatened species were identified with potential to occur with the REF proposal area and revised proposal area. These were assessed under section 7.3 of the NSW BC Act 2016 (BC Act) within 15 formal Tests of Significance as follows:

- Koala (*Phascolarctos cinereus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Grey-headed Flying fox (*Pteropus poliocephalus*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Spotted-tailed Quoll (*Dasyurus maculatus*)
- Rosenberg's Goanna (*Varanus rosenbergi*)
- Needle Geebung (*Persoonia acerosa*)
- Blue Mountains Swamps in the Sydney Basin Bioregion
- Threatened arboreal mammals (Eastern Pygmy-possum and Squirrel Glider)
- Threatened hollow-dependant bats (three species)
- Threatened cave-dependant bats (three species)
- Threatened woodland birds (six species)
- Threatened woodland robins (three species).

In accordance with the assessment criteria under section 7.3 of the BC Act, only one threatened species, the Eastern Pygmy-possum was considered to have the potential to be significantly impacted by the proposal. In accordance with the assessment criteria, the area of Eastern Pygmy-possum habitat to be removed as part of the proposal is considered likely to be important for all stages of the species' life cycle, for the relatively small number of individuals known to be a part of the local population. In lieu of any data regarding the presence of additional individuals beyond the Study Area (and thus evidence of the presence of a larger/more extensive population), the proposal is considered likely to have a direct impact on Eastern Pygmy-possum habitat, such that the viable local population(s) may be placed at risk of extinction.

A survey and monitoring program for the Eastern Pygmy-possum will be developed to better understand the extent of the population and whether there are additional individuals beyond the Study Area. The findings will be used to determine whether the proposal is likely to have significant impact on the local population(s).

For the hollow-dependent birds and bats, significant impacts will be avoided and contingent upon implementation of mitigation measures and provision of compensatory/supplementary habitat (nest boxes).

In relation to the Blue Mountains Swamp TEC and species with the potential to occur in association with it (Blue Mountains Skink, Giant Dragonfly, Klaphake's Sedge and the Superb Midge Orchid), there will be no direct impact to, or within five metres of, the swamp and potential indirect impacts will be avoided/minimised through implementation of stringent impact mitigation management actions. It is recommended that regular monitoring of the Swamp be conducted during construction and into operation and included in the project's FFMP to identify and remediate any impacts as a result of the proposal. Preparation of a Species Impact Statement (SIS) or entry into the NSW

Biodiversity Offset Scheme (BOS) will be required if it is determined that a significant impact to the Eastern Pygmy-possum as a result of the proposal is likely.

5.4.2 EPBC Act Significant Impact Criteria (SIC) assessments

The following six Commonwealth listed threatened species were identified with potential to occur with the REF proposal area and revised proposal area, were assessed in accordance with the EPBC Act and the Commonwealth MNES Significant Impact Guidelines (DAWE 2013):

- Koala (Phascolarctos cinereus)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Greater Glider (*Petauroides volans*)
- Grey-headed Flying fox (*Pteropus poliocephalus*)
- Needle Geebung (*Persoonia acerosa*)
- Temperate Highland Peat Swamps on Sandstone.

In accordance with the assessment criteria under the EPBC Act and the Commonwealth MNES Significant Impact Guidelines, none of the threatened biota (or important populations) listed above were considered likely to be significantly impacted by the proposal.

As for the hollow-dependent birds and bats assessed in the ToS above, significant impacts to the Greater Glider will be avoided and contingent upon implementation of mitigation measures and provision of compensatory/supplementary habitat (nest boxes). As such, a referral of the proposal to the Commonwealth Minister for the Environment is not required.

6 Mitigation

The specific indirect impacts and how they relate to the ecology of the study area, along with corresponding mitigation measures are discussed in detail in Table 6-1.The mitigation measures provided would be consistent with industry best practice to ensure that mitigation is effective. Monitoring of the effectiveness of the mitigation measures would be incorporated as part of the management actions associated with the proposal.

Construction and operation of the proposal will be undertaken in accordance with TfNSW Biodiversity Guidelines (RTA 2011):

- Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects
- Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects
- Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects
- Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects
- Re-use of woody debris and bushrock and Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects
- Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects
- Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity
- Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects
- Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects.

It is recommended that a project specific Flora and Fauna Management Plan (FFMP) be prepared to reflect biodiversity management measures associated with the proposal in order to protect and manage important biodiversity values, and detail key commitments relating to threatened species management, pest and weed management, and site hygiene practices.

The FFMP would be consistent with the current TfNSW Biodiversity Guidelines and include specific protocols dealing with any potential interaction between the proposal activities and threatened flora or fauna species during the construction and operational phase.

The FFMP will include directions for survey, monitoring and management of key threatened species known or considered to be potentially impacted by the proposal and protocols for reporting and managing any unforeseen threatened species occurrences within the study area.

In summary, mitigation measures to be undertaken during construction and post construction include:

Fencing and signposting

Fencing and/or the use of highly visible rope or tape boundaries will be used to delineate the boundary of vegetation clearing at the edge of the proposed construction boundary.

Signposting will be used to inform project personnel and site visitors of areas of conservation value to restrict entry or inform behaviour that will reduce incidental interactions with fauna.

Employee Education and General Environmental Controls

Employees and contractors would be educated on and required to implement the following controls, to avoid or at least minimise potential environmental impacts associated with the proposal:

- Minimise dust generation by minimising the extent and time that bare sand is exposed and by appropriate sand suppression.

- Procedures for the management of hydrocarbon and/or chemical spills including the requirements for vehicles to carry spill kits.
- Ensuring vehicles remain on designated roads and tracks and abide by site speed limits, through use of signposting and driver education during the induction process and in on-going project discussions.
- Management and removal of all rubbish from the site.

Pre-construction surveys for threatened flora

Targeted surveys for Small Pale Grass-lily (*Caesia parviflora* var. *minor*) and *Acacia baueri* subsp. *aspera* were not possible within the revised proposal area. Therefore, pre-clearance surveys (parallel transects 5-metres apart) in the revised proposal area are required between the months of October to February (during the recommended survey period) during the detailed design phase to confirm whether these species are present.

Vegetation Clearance Protocol

The clearing protocol will refer to the current TfNSW Vegetation Clearing Protocol, which in summary includes the following:

- Prior to clearing of native vegetation, ecologists are to survey for ground dwelling fauna and to remove any fauna/ fauna habitats to adjacent areas that would not be further disturbed.
- Prior to clearing of remnant hollow-bearing trees or habitat trees, ecologists are to be engaged to supervise felling. All hollow-bearing trees that are accessible safely from the ground are to be checked and identified fauna relocated. Hollows higher up and not accessible from the ground are to be identified and trees felled gently by an excavator or dozer and left overnight to allow fauna to relocate.
- Any fauna displaced during clearing are to be captured where possible and relocated to pre-planned areas (fauna to be captured and handled only by personnel trained to do so).
- In an event that fauna are injured during clearing, the NSW Wildlife Information, Rescue and Education Service (WIRES) will be contacted to handle and collect for appropriate care and rehabilitation.

Seed Collection Protocol

It is noted that Transport for NSW would undertake seed collection across the Great Western Highway Upgrade Program. As part of that collection, seed collection should be undertaken for flora species such as Needle Geebung (*Persoonia acerosa*), in an effort to aid in re-establishment of individuals as part of revegetation works for the proposal.

Fauna sensitive road design

Consideration should be given to current fauna mortality within the study area and benefit of including fauna crossing structures (exclusion fencing/glider poles/overpasses) to mitigate the potential impact of a reduction in habitat connectivity and fauna movement.

Based on the design meeting held in August 2021, it was identified that the K2M section of the REF proposal area had the best suitability for the installation of glider poles in the vicinity of Pulpit Hill. The option to install glider poles that may facilitate movement across the road will be dependent on the outcome of fauna mortality monitoring, to be undertaken as part of the FFMP, as detailed below previously and below.

Nest box strategy

At least 220 hollow-bearing trees within the REF proposal area and revised proposal area will be subject to removal. A full inventory of hollow-bearing trees recorded including the species, approximate Diameter at Breast Height (DBH) and number and size of hollows is provided in Annexure F.

In accordance with Guide 8: Nest boxes in the Biodiversity Guidelines: Protecting and managing biodiversity (RTA 2011), a habitat replacement/ nest box strategy will be developed and implemented for the proposal. The Nest box strategy will be incorporated into the FFMP.

The Eastern Pygmy-possum survey and monitoring program will include installation of nest boxes as supplementary/compensatory habitat for the species.

6.1 Residual impacts

Where there are residual impacts to native vegetation and threatened biodiversity habitat, that cannot avoided or mitigated, Transport would offset these impacts in accordance with the Transport 'Guideline for Biodiversity Offsets' (TfNSW 2016). Offsets would be sought for both this proposal and any other projects within the Great Western Highway Upgrade Program for which biodiversity impacts have not separately been offset. Section 7 outlines the offset strategy for the proposal.

Table 6-1: Mitigation measures

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Removal of native vegetation.	Native vegetation removal will be minimised through detailed design.	Detailed design phase	Effective in reducing area of impact	Indirect impacts to remaining patches are discussed in Section 5.
Vehicle strike	It is recommended that TfNSW monitor road kills along Great Western Highway before, during and after commencement of the proposal.	Detailed design	Effective	Unlikely
Indirect impacts on native vegetation and habitat	Measures to further avoid and minimise the area of direct impact on all native vegetation will be investigated during detailed design and implemented where practicable and feasible in order to avoid direct impacts to a sensitive areas or area adjacent to the Blue Mountains National Park.	Detailed design phase	Effective in reducing area of impact	Indirect impacts are discussed in Section 5.2.
	Exclusion zones will be set up across the entire REF proposal area and revised proposal area, at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011). There will be an established buffer area of at least five metres between the proposal area and margin of the swamp.	During construction	Effective	Unlikely
	Installation of stormwater/sediment and erosion control mechanisms to prevent sediment or dirty water discharging into the Blue Mountain Swamp TEC.	During construction	Effective	Unlikely
Wildlife connectivity and habitat fragmentation	Fauna mortality should be monitored throughout construction and into operation to determine if mitigation for the potential impact of a reduction in habitat connectivity and fauna movement. Is required.	Detailed design phase	Effective in maintaining fauna connectivity	Unlikely
	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Prior to construction	Effective	Unlikely

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
	Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Unlikely
	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Post construction	Effective	Unlikely
	The unexpected species find procedure is to be followed under Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	Unlikely
Removal of threatened species habitat and habitat features	Habitat removal will be minimised through detailed design.	Detailed design	Effective	Avoidance discussed in Section .
	For flora species such as Needle Geebung (*Persoonia acerosa*), a seed collection program will be implemented in an effort to aid in re-establishment of individuals as part of revegetation works for the proposal	Prior to construction	Effective	Need to identify if there will be residual impacts from loss of threatened plants
	Habitat removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Unlikely
	Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock* and *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Proven	Unlikely

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Eastern Pygmy-possum	Development of survey and monitoring program. The monitoring program will include the installation of the nest boxes in areas outside the REF proposal area and revised proposal area, which will also provide suitable supplementary nesting habitat.	Prior to construction	Effective	Potential - the findings of the program will determine whether the proposal will have a significant impact on the local population(s) and better inform proposed mitigation measures.
	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) if threatened fauna, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	Unlikely
Removal of threatened plants	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Proven	Need to identify if there will be residual impacts from loss of threatened plants
	One threatened flora species was recorded during the field survey. Collection of seed for revegetation works will be conducted in an effort to mitigate impacts to the species and allow for re-establishment within the vicinity of the study area. If other unexpected individuals are identified an unexpected finds protocol is to be implemented.	Prior to construction	Proven	Unlikely
	Targeted surveys for Small Pale Grass-lily (*Caesia parviflora* var. *minor*) and *Acacia baueri* subsp. *aspera* were not possible within the revised proposal area. Therefore, pre-clearance surveys (parallel transects 5-metres apart) in the revised proposal area are required between the months of October to February (during the recommended survey period).	Prior to construction in the revised proposal area (October to February)	Proven	Unlikely

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) if threatened flora species, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	Unlikely
Groundwater dependent ecosystems	Interruptions to water flows associated with groundwater dependent ecosystems (e.g. Upland Swamp) will be minimised through detailed design.	Detailed design	Effective	Unlikely
Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design and mitigated via preparation and implementation of the following: • Preparation of progressive Erosion and Sediment Control Plans (ESCPs) and their continual revision and update • Preparation of a Storm Water Management Plan and other aspects of the Construction Environment Management Plan to manage water quality impacts during construction of the proposal • Preparation of Water Quality Management Plan (surface and groundwater) to describe water quality monitoring before and during construction • Design of scour protection at new stormwater outlets and culverts and drainage basins • Stormwater drainage design which incorporated a treatment trains and drainage basing to achieve a neutral or beneficial effect on the surrounding waterways.	Detailed design, during construction and post construction	Effective	Unlikely
Fragmentation of identified habitat corridors	Connectivity measures will be implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA 2011).	Detailed design, during construction and post construction	Effective	Unlikely – high connectivity with the broader landscape and the incorporation of fauna sensitive road design.
	Any connectivity measures implemented will be installed under the supervision of an experienced ecologist.	During construction	Effective	

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Need to identify if there will be residual impacts from loss of habitat in edge areas
Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Unlikely
Invasion and spread of weeds	Weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Unlikely
Invasion and spread of pests	Pest species will be managed within the proposal site.	During construction	Effective	Unlikely
Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). • Any excavated earth must be either disposed or reused appropriately with care taken to avoid spreading propagules of weeds or infested soil or plant material. • Exercise correct plant hygiene to minimise spread of weeds, Phytophthora and other contaminants, including wash down when moving between weedy and non-weedy parts of the proposal. • All weed material removed during the construction works should be disposed of in a suitable waste facility and not mulched onsite to avoid the reintroduction and further spread of weeds and pathogens in the area.	During construction	Effective	Unlikely
Noise, light and vibration	Shading and artificial light impacts on sensitive areas or areas adjacent to the Blue Mountains National Park will be minimised through detailed design.	Detailed design	Effective	Unlikely – road lighting and noise currently operating.

7 Offset strategy

This biodiversity offset strategy has been developed as per TfNSW's *Guideline for Biodiversity Offsets* (2016). It provides an estimate of the biodiversity credit requirement for the proposal and identifies the various options available to TfNSW to satisfy the offset obligation. Once detailed design is complete, the credit requirement would be updated and finalised and a detailed Biodiversity Offset Strategy identifying how the offset obligation would be met would be developed.

Note TfNSW (2016) refers to BioBanking and use of the Framework for Biodiversity Assessment (FBA) to determine biodiversity offset credit obligations. The FBA and BioBanking was replaced by the Biodiversity Offset Scheme (BOS) and use of the Biodiversity Assessment Method (BAM) Calculator (BAM-C) to determine offset requirements for unavoidable impacts to biodiversity under the BC Act. As such, the BAM-C has been used to determine the offset requirement for the proposal.

Biodiversity offset thresholds (as presented in Table 1 of section 4.2 of TfNSW 2016) relevant to the proposal and the resulting credit requirements are summarised in Table 7-1. The BAM-C Credit Summary Report is provided and is based on the revised design impact to 50.01 hectares of native vegetation, as per the BAM-C, the proposal requires the following biodiversity offsets:

- 924 ecosystem credits for impact to known habitat of seven NSW listed threatened ecosystem credit species (Gang-gang Cockatoo, Brown Treecreeper, Large Bentwing-bat, Little Bentwing-bat, Greater Broad-nosed Bat, Eastern Coastal Free-tailed Bat, Yellow-bellied Sheathtail-bat) (as per the original REF BAR).
- 1,281 species credits for impacts to known habitat (including the REF proposal area and revised proposal area) for the Eastern Pygmy-possum (species credit species under the BAM).

Note impacts to *Persoonia acerosa* did not meet the thresholds triggering the requirement for offsets (Table 7-1.

Table 7-1 Offsetting thresholds for REFs (as per TfNSW 2016)

Description of activity or impact	Consider offsets or supplementary measures	Relevant to the proposal?	Offsets required
Activities in accordance with Roads and Maritime Services Environmental assessment procedure: Routine and Minor Works (RTA 2011)	No	No	Not applicable
Works on cleared land, plantations, exotic vegetation where there are no threatened species or habitat present	No	No	Not applicable
Works involving clearing of vegetation planted as part of a road corridor landscaping program (this includes where threatened species or species comprising listed ecological communities have been used for landscaping purposes)	No	No	Not applicable
Works involving clearing of national or NSW listed critically endangered ecological communities (CEEC)	Where there is any clearing of an CEEC in moderate to good condition	No	None
Works involving clearing of nationally listed threatened ecological community (TEC) or nationally listed threatened species habitat	Where clearing >1 ha of a TEC or habitat in moderate to good condition	Yes. Clearing of 1 individual of Persoonia acerosa.	Area of occupation less than 1 ha. No offsets required
Works involving clearing of NSW endangered or vulnerable ecological community	Where clearing > 5 ha or where the ecological community is subject to an SIS	No	Not applicable

Description of activity or impact	Consider offsets or supplementary measures	Relevant to the proposal?	Offsets required
Works involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the OEH Threatened Species Profile Database (TSPD)	Where clearing > 1ha or where the species is the subject of an SIS	**Yes. Clearing of 50.01 ha of known habitat for the Eastern Pygmy-possum**	**1,281 Eastern Pygmy-possum species credits**
Works involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in OEH 's Threatened Species Profile Database (TSPD)	Where clearing > 5ha or where the species is the subject of an SIS	**Yes. Clearing of 50.01 ha of known habitat for 7 NSW listed threatened ecosystem credit species:** • **Gang-gang Cockatoo** • **Brown Treecreeper** • **Large Bentwing-bat** • **Little Bentwing-bat** • **Greater Broad-nosed Bat** • **Eastern Coastal Free-tailed Bat** • **Yellow-bellied Sheathtail-bat**	**924 ecosystem credits**
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	Not applicable	

As per the Guideline (TfNSW 2016), the Biodiversity Offset Strategy will be further developed by TfNSW identifying how the offset obligation will be met. There are four options available to meet offset requirements for REF projects. These are:

- Purchase biodiversity credits from the market.
- Work with private landholders to enter into a Biodiversity Stewardship Agreement (BSA) on their land and then buy the credits issued.
- Establish a Biodiversity Stewardship Site on TfNSW-owned land to supply the credits (the land is then on-sold into the private market or transferred to a public land manager with a Biodiversity Stewardship Agreement in place [including the allocation of all in perpetuity management funds; the total fund deposit]).
- Undertake conservation measures.

As per TfNSW (2016), supplementary measures can be used in lieu of offsets where it is not feasible or reasonable to supply offsets. This would include situations where no landholders express an interest in providing biodiversity credits despite TfNSW publicly seeking expressions of interest in a relevant newspaper.

Supplementary measures are activities that are likely to lead to improvements in biodiversity, but do not involve in-perpetuity arrangements for the management of land through a BSA. Supplementary measures may involve sponsoring (funding), the following types of activities:

- Relevant research and biological survey activities in partnership with a university or recognised conservation organisation
- Targeted conservation management activities as part of DPIE's Saving our Species program

- Vegetation rehabilitation and restoration activities in partnership with a local land care groups and/or public land managers (including local government, Local Land Services and National Parks and Wildlife Service).

The Biodiversity Offset Strategy would be updated and should the method of procuring the offsets/satisfying the offset requirement.

8 Conclusion

TfNSW have aimed to avoid and minimise environmental impacts from the proposal as far as practical and have proposed a series of mitigation measures to manage potential indirect impacts to biodiversity from the proposal.

About 68.80 hectares (ha) of native vegetation and associated habitat, and 15.11 hectares of non-native vegetation (comprising the existing Great Western Highway, services, footpaths, cleared areas) occurs within the study area. The native vegetation has been subject to varying levels of historical clearing and edge effects from the existing Great Western Highway and surrounding residential land.

The native vegetation comprises the following three Plant Community Types (PCTs) in low to moderate condition:

- PCT 1248 *Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion*
- PCT 967 *Narrow-leaved Peppermint - Silvertop Ash - Mountain Grey Gum shrubby open forest of the upper Blue Mountains, Sydney Basin Bioregion*
- PCT 1078 *Prickly Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion*.

One threatened flora species, Needle Geebung (*Persoonia acerosa*) was recorded within the southern portion of the study area.

Eight threatened fauna species were recorded during the field survey: Eastern Pygmy-possum (*Cercartetus nanus*), Large Bentwing-bat (*Miniopterus orianae oceanensis*), Little Bentwing-bat (*Miniopterus australis*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Eastern Freetail Bat (*Micronomous norfolkensis*), Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*) and Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*).

The proposal would result in the direct impact of up to 50.01 hectares of vegetation regarded as ‘native vegetation,’ (as defined in the BAM) within the proposed REF proposal area and revised proposal area (area subject to direct impacts). The majority of vegetation likely to be affected by the proposal is located adjacent to the Great Western Highway and has been subject to historic clearing and edge effects and is therefore thinned in areas and some areas are dominated by a range of introduced species. Up to 220 hollow-bearing trees will be removed.

Test of significance assessments under Section 7.3 of the BC Act were completed for one threatened flora, 26 threatened fauna species and one Endangered Ecological Community (EEC) identified with the potential to occur or be impacted by the proposal.

In accordance with the assessment criteria, the proposal is considered to have the potential to significantly impact the local population of the Eastern Pygmy-possum (if further monitoring and mitigation measures aren’t applied).

An Eastern Pygmy-possum monitoring program is to be developed to better understand the extent of the population and whether there are additional individuals beyond the Study Area. The monitoring program will include the installation of the nest boxes in areas outside the REF proposal area and revised proposal area, which will also potentially provide suitable supplementary nesting habitat.

The findings of the program will determine whether the proposal is likely to have significant impact on the local population(s), and thus whether a SIS or entry into the BOS is required.

For the other threatened biota with potential to occur or be impacted by the proposal, upon implementation of proposed avoidance, mitigation and habitat compensation measures, it is considered unlikely that any threatened biodiversity will be significantly impacted by the proposal.

Significant Impact Criteria assessments under the EPBC Act were completed for one threatened flora species, four threatened fauna species and one EEC identified with the potential to occur or be impacted by the proposal. The assessments concluded that significant impacts were unlikely. Given the proposal is

being undertaken by TfNSW under Division 5.1 of the EP&A Act, the strategic assessment applies, and a Referral under the Commonwealth is not required.

A number of recommendations have been made to avoid, minimise and mitigate potential impacts to biodiversity (Section 6; Table 6-1). Provided these recommendations are implemented, the proposal is considered unlikely to result in significant impacts to threatened biodiversity. Additional mitigation measures have been provided to minimise residual impacts during the proposed works.

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Annexure A

Species recorded

Recorded flora

Recorded flora and species abundance

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Acacia longifolia	Shrub (SG)							2			1		10		3		
Acacia terminalis	Shrub (SG)								1			5		1			
Alchornea ilicifolia	Shrub (SG)			5						1				10			
Anisopogon avenaceus	Grass & grasslike (GG)				3												
Anthoxanthum odoratum	Weed other	50															20
Aristida ramosa	Grass & grasslike (GG)																
Aristida vagans	Grass & grasslike (GG)																
Asparagus spp.	(blank)																
Baeckea imbricata	Shrub (SG)								10								
Banksia ericifolia	Shrub (SG)					1			50								
Banksia marginata	Shrub (SG)													2			
Banksia serrata	Tree (TG)																
Banksia spinulosa	Shrub (SG)															10	
Baumea acuta	Grass & grasslike (GG)																
Baumea rubiginosa	Grass & grasslike (GG)																50
Baumea teretifolia	Grass & grasslike (GG)																
Bidens pilosa	HTW							10									
Billardiera scandens	Other (OG)				30				10					10		3	
Blandfordia nobilis	Forb (FG)			1													
Bossiaea heterophylla	Shrub (SG)			5								1		1			
Bursaria spinosa	Shrub (SG)									1							
Caesia parviflora	Forb (FG)															1	
Caladenia carnea	Forb (FG)															10	
Callitris muelleri	Tree (TG)																

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Carex appressa	Grass & grasslike (GG)						5	10			5						
Cassytha glabella	Other (OG)			1					1					10			
Caustis flexuosa	Grass & grasslike (GG)											10		10			
Cirsium arvense	Weed other		1								10						
Cirsium vulgare	Weed other	5						1							5		10
Commersonia fraseri	Shrub (SG)									1							
Conyza bonariensis	Weed other							5			10						
Cryptandra amara	Shrub (SG)				1												
Cyathea australis	Other (OG)						1										
Cynodon dactylon	Grass & grasslike (GG)	100		100													
Cyperus	Grass & grasslike (GG)		10														
Cyperus esculentus	Weed other	100															
Dampiera purpurea	Forb (FG)											1					
Dampiera stricta	Forb (FG)			10	20				10			20	50	100		10	
Daviesia ulicifolia	Shrub (SG)												10				
Dianella caerulea	Forb (FG)											5	10	2	5	1	
Dichondra repens	Forb (FG)			50									50	100			
Dillwynia retorta	Shrub (SG)			5					15			200					
Diuris	Forb (FG)											1					
Drosera peltata	Forb (FG)																
Drosera spatulata	Forb (FG)														500		
Empodisma minus	Grass & grasslike (GG)															1	
Entolasia	Grass & grasslike (GG)			15				1		1000					100	200	20
Entolasia	Grass & grasslike (GG)										100		10	50	100	10	
Epacris microphylla	Shrub (SG)				20				100								
Epacris paludosa	Shrub (SG)															10	
Epacris pulchella	Shrub (SG)								20		10				200		

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Eragrostis curvula	HTW																
Eucalyptus cypellocarpa	Tree (TG)									4							
Eucalyptus mannifera	Tree (TG)																
Eucalyptus oreades	Tree (TG)																3
Eucalyptus piperita	Tree (TG)									4							
Eucalyptus sclerophylla	Tree (TG)															1	
Eucalyptus sieberi	Tree (TG)																
Eucalyptus viminalis	Tree (TG)																
Gahnia aspera	Grass & grasslike (GG)							1			1						10
Gahnia sieberiana	Grass & grasslike (GG)						3			2							20
Galium propinquum	Forb (FG)			30													
Geranium solanderi	Forb (FG)	500	20	100			200			1000							
Gleichenia dicarpa	Fern (EG)						1										
Gonocarpus hirtus	Forb (FG)										5				100		
Gonocarpus teucrioides	Forb (FG)									100	1			10			10
Goodenia bellidifolia	Forb (FG)											1	10				
Grevillea acanthifolia	Shrub (SG)																3
Grevillea laurifolia	Shrub (SG)								10								
Hakea	Shrub (SG)						1		5								
Hakea dactyloides	Shrub (SG)						4	10								10	
Hemarthria uncinata	Grass & grasslike (GG)																1
Hibbertia	Shrub (SG)			1												5	
Hibbertia circumdans	Shrub (SG)								1								
Hoya												1					

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Imperata cylindrica	Grass & grasslike (GG)			10		20			30								
Isopogon anemonifolius	Shrub (SG)								20			10					
Isopogon anethifolius	Shrub (SG)			5													
Juncus acutus	HTW	10				15											
Kunzea ericoides	Shrub (SG)																
Lambertia formosa	Shrub (SG)				1												
Lepidosperma neesii	Grass & grasslike (GG)																
Leptomeria acida	Shrub (SG)			5													
Leptospermum juniperinum	Shrub (SG)			3		1											
Leptospermum polygalifolium	Shrub (SG)			1	5					1	5						
Leptospermum trinervium	Shrub (SG)						7										
Lepyrodia scariosa	Grass & grasslike (GG)								100		10			100		5	
Leucopogon	Shrub (SG)								10		1	10	1	10	1		
Leucopogon lanceolatus	Shrub (SG)											5					
Ligustrum sinense	HTW																1
Lindsaea linearis	Fern (EG)								100				10	10		100	
Lomandra	Grass & grasslike (GG)								20								
Lomandra	Grass & grasslike (GG)		10	3			5			10						20	
Lomandra glauca	Grass & grasslike (GG)			65	20								100	10			
Lomandra obliqua	Grass & grasslike (GG)								10			100	10				
Lomatia silaifolia	Shrub (SG)			1					1			5	5	15			
Lycopodium (blank)	Fern (EG)													20			
Microlaena stipoides	Grass & grasslike (GG)																
Monotoca ledifolia	Shrub (SG)								1								

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Opercularia	Forb (FG)															1	
Opercularia hispida	Forb (FG)			50													
Oplismenus hirtellus	Grass & grasslike (GG)									10		10					
Oxalis perennans	Forb (FG)	500		100						100							
Patersonia	Forb (FG)															5	
Patersonia glabrata	Forb (FG)				10				15			10					
Pelargonium inodorum	Forb (FG)			50													
Pellaea falcata	Fern (EG)														2		
Pennisetum clandestinum	Weed other				100												
Persoonia lanceolata	Shrub (SG)			1													
Persoonia laurina	Shrub (SG)											3	2		1		
Persoonia levis	Shrub (SG)			1								2					
Petrophile sessilis	Shrub (SG)													5			
Phalaris aquatica	Weed other																50
Phyllanthus	Shrub (SG)											100	15				
Phyllota	Shrub (SG)															5	
Pittosporum undulatum	Shrub (SG)		1														
Plantago	Weed other	200	10					50			200				10		
Platysace linearifolia	Shrub (SG)											20	5	10			
Poa labillardierei	(blank)			1	2												
Podolobium ilicifolium	Shrub (SG)											5					
Polyscias elegans	Tree (TG)															3	
Polyscias sambucifolia	Shrub (SG)												1		3	3	10
Pomaderris elliptica	(blank)				2				2					5		5	
Pratia purpurascens	Forb (FG)									500	10						
Pteridium esculentum	Fern (EG)			5			5					20				50	

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Ptilothrix deusta	Grass & grasslike (GG)																
Rubus fruticosus sp. agg.	HTW																
Rubus parvifolius	Shrub (SG)			10			10										30
Schoenus melanostachys	Grass & grasslike (GG)						100			3							
Selaginella uliginosa	Fern (EG)														1000		
Senecio madagascariensis	Weed other				1						5						
Smilax glyciphylla	Other (OG)									1					1		
Solanum prinophyllum	Forb (FG)			5								1					
Stackhousia nuda	Forb (FG)				1				5			25	20	10			
Stylidium	Forb (FG)		10														
Stylidium graminifolium	Forb (FG)															10	
Taraxacum officinale	Weed other	10	10	3	5			20			50				10		
Themeda triandra	Grass & grasslike (GG)							10			20						
Todea barbara	Other (OG)																
Verbena	Weed other	30															
Viola hederacea	Forb (FG)									200						10	
Xanthorrhoea	Other (OG)											1	5				
Xanthosia	Forb (FG)			5													
Xanthosia tridentata	Forb (FG)				5							1					

Recorded flora and species percent cover

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Grevillea acanthifolia	Shrub (SG)																3
Leptomeria acida	Shrub (SG)			0.5													
Baumea acuta	Grass & grasslike (GG)																1

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Juncus acutus	HTW	0.3				0.5											
Cryptandra amara	Shrub (SG)				0.1												
Isopogon anemonifolius	Shrub (SG)								0.5			0.2					
Isopogon anethifolius	Shrub (SG)			2													
Carex appressa	Grass & grasslike (GG)						0.2	0.2			0.2						
Phalaris aquatica	Weed other																0.5
Cirsium arvense	Weed other		0.1								0.2						
Gahnia aspera	Grass & grasslike (GG)			5.1				0.1	1.5	5	0.2		1	1		0.1	0.5
Hibbertia	Shrub (SG)			0.1												0.1	
Cyathea australis	Other (OG)						1			20							
Anisopogon avenaceus	Grass & grasslike (GG)				0.1												
Todea barbara	Other (OG)						75	2									25
Goodenia bellidifolia	Forb (FG)											0.1	0.1				
Conyza bonariensis	Weed other				1			0.1			0.1						
Verbena	Weed other			2			2			2		0.1	0.5	0.2	0.1	0.1	
Dianella caerulea	Forb (FG)															0.1	
Caladenia carnea	Forb (FG)								0.1								
Hibbertia circumdans	Shrub (SG)	35	5		1.5	15		15			5				10		
Pennisetum clandestinum	Weed other	60	30			90									3		
Eragrostis curvula	HTW			0.5		0.5		2	0.4				2				
Imperata cylindrica	Grass & grasslike (GG)								0.2				2				
Lomandra	Grass & grasslike (GG)									25							
Eucalyptus cypellocarpa	Tree (TG)			2		3	1	0.5	1	1		3	2	1		5	
Hakea dactyloides	Shrub (SG)	1		1.5	5		10	5		40	40				15		
Cynodon dactylon	Grass & grasslike (GG)								1		1				1		

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Ptilothrix deusta	Grass & grasslike (GG)						0.1										5
Gleichenia dicarpa	Fern (EG)															0.1	
Polyscias elegans	Tree (TG)				0.1				0.1					2.5		0.2	
Pomaderris elliptica	(blank)					0.5			0.2								
Banksia ericifolia	Shrub (SG)							10									
Kunzea ericoides	Shrub (SG)			1		2	0.5			30		0.5		3		1	
Leucopogon	Shrub (SG)	1															
Pteridium esculentum	Fern (EG)														0.3		
Cyperus esculentus	Weed other											0.2		0.3			
Pellaea falcata	Fern (EG)				0.1												
Caustis flexuosa	Grass & grasslike (GG)									0.5							
Lambertia formosa	Shrub (SG)							10									2
Commersonia fraseri	Shrub (SG)			0.1					0.1			1	1	0.3			
Rubus fruticosus sp. agg.	HTW				0.5				0.2			0.2					
Cassytha glabella	Other (OG)			1	0.5							1	0.5	0.5			
Patersonia glabrata	Forb (FG)									0.2					0.1		
Lomandra glauca	Grass & grasslike (GG)															0.1	
Smilax glyciphylla	Other (OG)									0.2						0.1	
Stylidium graminifolium	Forb (FG)			0.1								0.1		0.1			
Viola hederacea	Forb (FG)			20						0.2		0.3	0.1				
Bossiaea heterophylla	Shrub (SG)			20								0.2	0.1				
Oplismenus hirtellus	Grass & grasslike (GG)										0.1				0.2		
Phyllanthus	Shrub (SG)			0.5													
Gonocarpus hirtus	Forb (FG)			0.1						0.1				0.5			
Opercularia hispida	Forb (FG)			1								0.5					
Alchornea ilicifolia	Shrub (SG)								0.3								

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Podolobium ilicifolium	Shrub (SG)			0.1													
Baeckea imbricata	Shrub (SG)			1		0.2											30
Pelargonium inodorum	Forb (FG)			0.2	0.2												
Leptospermum juniperinum	Shrub (SG)	0.3	0.1	0.1				0.3			0.2				0.1		
Poa labillardierei	(blank)	0.3	0.1					0.3			0.2				0.1		
Persoonia lanceolata	Shrub (SG)			1								0.5					
Plantago	Weed other				20				0.2								
Leucopogon lanceolatus	Shrub (SG)											2	0.5		0.3		
Grevillea laurifolia	Shrub (SG)								0.1								
Persoonia laurina	Shrub (SG)			0.3								0.2	1				
Monotoca ledifolia	Shrub (SG)											0.3	0.1	0.1			
Persoonia levis	Shrub (SG)								0.1				0.1	0.1		0.1	
Platysace linearifolia	Shrub (SG)							0.2			0.1		0.5		0.2		
Lindsaea linearis	Fern (EG)				0.1						0.1						
Acacia longifolia	Shrub (SG)										10			10			
Lomandra	Grass & grasslike (GG)			0.2				0.1	1	1				0.5	0.2	0.3	0.2
Senecio madagascariensis	Weed other			0.2				0.1		1					0.2	0.3	0.2
Eucalyptus mannifera	Tree (TG)						1		2	0.5							
Banksia marginata	Shrub (SG)				0.2				0.5								
Entolasia	Grass & grasslike (GG)															0.1	
Schoenus melanostachys	Grass & grasslike (GG)		30														
Epacris microphylla	Shrub (SG)														1		
Empodisma minus	Grass & grasslike (GG)			0.1													
Callitris muelleri	Tree (TG)			1	0.1				0.1			0.3	0.2	0.2			
Lepidosperma neesii	Grass & grasslike (GG)								0.1			0.5	0.2				
Blandfordia nobilis	Forb (FG)	0.2															0.2

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Stackhousia nuda	Forb (FG)	0.1	0.1	0.1	0.1			0.1			0.1				0.2		
Lomandra obliqua	Grass & grasslike (GG)			5	40	5	5	1								10	5
Anthoxanthum odoratum	Weed other															0.5	
Taraxacum officinale	Weed other															0.1	
Eucalyptus oreades	Tree (TG)			0.2			0.2										0.3
Epacris paludosa	Shrub (SG)														1		
Caesia parviflora	Forb (FG)	0.5		0.1						0.1							
Rubus parvifolius	Shrub (SG)							0.1									
Drosera peltata	Forb (FG)			30						5		20	10		1		
Oxalis perennans	Forb (FG)			0.5	0.5	1		45	30	0.5	0.2		10	40	2		30
Bidens pilosa	HTW			0.2								0.1					
Xanthosia	Forb (FG)			0.5													
Eucalyptus piperita	Tree (TG)								0.2		0.1			5	0.5		
Leptospermum polygalifolium	Shrub (SG)									0.5	0.1						
Solanum prinophyllum	Forb (FG)											0.1					
Galium propinquum	Forb (FG)									3							
Epacris pulchella	Shrub (SG)			0.2									0.1	0.2			
Pratia purpurascens	Forb (FG)			0.2					0.5			1	10	1			
Dampiera purpurea	Forb (FG)																0.5
Aristida ramosa	Grass & grasslike (GG)			1									0.1	2	0.5	1	0.2
Dichondra repens	Forb (FG)			1	0.2				0.1					0.5		0.1	
Dillwynia retorta	Shrub (SG)								0.5		0.1			0.2		0.1	
Baumea rubiginosa	Grass & grasslike (GG)								5							0.2	
Polyscias sambucifolia	Shrub (SG)											25					
Billardiera scandens	Other (OG)								2					0.3			
Lepyrodia scariosa	Grass & grasslike (GG)			15					25			35	5	5		10	

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Eucalyptus sclerophylla	Tree (TG)						0.5			0.5						10	1
Banksia serrata	Tree (TG)			0.1					0.1			0.3	0.5	0.5			
Petrophile sessilis	Shrub (SG)																0.1
Eucalyptus sieberi	Tree (TG)	2	0.1	0.2			0.2			0.5							1
Gahnia sieberiana	Grass & grasslike (GG)														0.5		
Lomatia silaifolia	Shrub (SG)									1							
Ligustrum sinense	HTW			60					5							5	
Geranium solanderi	Forb (FG)		1.1									0.4	0.5	0.1		0.3	
Drosera spatulata	Forb (FG)		1														
Bursaria spinosa	Shrub (SG)											0.1					
Banksia spinulosa	Shrub (SG)													0.1			
Asparagus spp.	(blank)															0.1	
Cyperus	Grass & grasslike (GG)															0.1	
Diuris	Forb (FG)															0.1	
Hoya			0.1														
Lycopodium (blank)	Fern (EG)											0.2	0.5				
Opercularia	Forb (FG)		45								25						
Patersonia	Forb (FG)		45								25						
Phyllota	Shrub (SG)			0.1	0.2				0.1		0.5	1.2	0.6	0.8	0.5	0.2	
Stylidium	Forb (FG)			0.1	0.2				0.1			0.2	0.5	0.5		0.1	
Xanthorrhoea	Other (OG)										0.5	1	0.1	0.3	0.5	0.1	
Microlaena stipoides	Grass & grasslike (GG)						0.5		0.5						20		
Dampiera stricta	Forb (FG)														20		
Entolasia	Grass & grasslike (GG)						0.5		0.5								
Baumea teretifolia	Grass & grasslike (GG)								0.1			0.3		0.1			
Hakea	Shrub (SG)									0.2	0.1			0.2			0.1
Acacia terminalis	Shrub (SG)							0.5			0.5						
Gonocarpus teucrioides	Forb (FG)				0.1							0.1					

Species	Growth Form	6171s h01	6171s h02	6171s h03	6171s h04	6171s h05	6171s h06	6171s h07	6171s h08	6171s h09	6171s h10	6171s h11	6171s h12	6171s h13	6171s h14	6229s h01	6229s h03
Themeda triandra	Grass & grasslike (GG)						5		5			5	35			20	
Xanthosia tridentata	Forb (FG)												0.5				
Leptospermum trinervium	Shrub (SG)						2								0.5		
Daviesia ulicifolia	Shrub (SG)																0.1
Selaginella uliginosa	Fern (EG)		1														
Hemarthria uncinata	Grass & grasslike (GG)				50						1						
Pittosporum undulatum	Shrub (SG)													55			
Aristida vagans	Grass & grasslike (GG)	0.1				1		0.1							0.2		0.1
Eucalyptus viminalis	Tree (TG)		1	0.1			1.3	2		10.1		0.2	10		0.2		20.2
Cirsium vulgare	Weed other																

Recorded fauna

Fauna group	Common Name	Scientific name	Status	
			BC Act	EPBC Act
Amphibia				
Amphibia	Eastern Common Froglet	*Crinia signifera*	-	-
Aves				
Aves	Australian Magpie	*Cracticus tibicen*	-	-
Aves	Australian Raven	*Corvus coronoides*	-	-
Aves	Brown Thornbill	*Acanthiza pusilla*	-	-
Aves	Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	Vulnerable	-
Aves	Crimson Rosella	*Platycercus elegans*	-	-
Aves	Eastern Koel	*Eudynamys orientalis*	-	-
Aves	Eastern Spinebill	*Acanthorhynchus tenuirostris*	-	-
Aves	Eastern Yellow Robin	*Eopsaltria australis*	-	-
Aves	Galah	*Eolophus roseicapilla*	-	-
Aves	Gang-gang Cockatoo	*^^Callocephalon fimbriatum*	Vulnerable	-
Aves	Grey Fantail	*Rhipidura albiscapa*	-	-
Aves	Laughing Kookaburra	*Dacelo novaeguineae*	-	-
Aves	Lewin's Honeyeater	*Meliphaga lewinii*	-	-
Aves	Little Wattlebird	*Anthochaera chrysoptera*	-	-
Aves	New Holland Honeyeater	*Phylidonyris novaehollandiae*	-	-
Aves	Noisy Friarbird	*Philemon corniculatus*	-	-
Aves	Pied Butcherbird	*Cracticus nigrogularis*	-	-
Aves	Pied Currawong	*Strepera graculina*	-	-
Aves	Rainbow Lorikeet	*Trichoglossus moluccanus*	-	-
Aves	Red Wattlebird	*Anthochaera carunculata*	-	-
Aves	Satin Bowerbird	*Ptilonorhynchus violaceus*	-	-
Aves	Silvereye	*Zosterops lateralis*	-	-
Aves	Striated Pardalote	*Pardalotus striatus*	-	-
Aves	Striated Thornbill	*Acanthiza lineata*	-	-
Aves	Sulphur-crested Cockatoo	*Cacatua galerita*	-	-
Aves	Superb Lyrebird	*Menura novaehollandiae*	-	-
Aves	White-browed Scrubwren	*Sericornis frontalis*	-	-
Aves	White-throated Treecreeper	*Cormobates leucophaea*	-	-
Aves	Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	-	-
Mammalia				
Mammalia	Black Rat	*Rattus rattus*	-	-
Mammalia	Brown Antechinus	*Antechinus stuartii*	-	-
Mammalia	Bush Rat	*Rattus fuscipes*	-	-
Mammalia	Cat	*Felis catus*	-	-
Mammalia	Chocolate Wattled Bat	*Chalinolobus morio*	-	-
Mammalia	Common Brushtail Possum	*Trichosurus vulpecula*	-	-
Mammalia	Common Ringtail Possum	*Pseudocheirus peregrinus*	-	-
Mammalia	Common Wombat	*Vombatus ursinus*	-	-
Mammalia	Eastern Free-tailed Bat	*Mormopterus ridei*	-	-

Fauna group	Common Name	Scientific name	Status	
			BC Act	EPBC Act
Mammalia	Eastern Horseshoe Bat	*Rhinolophus megaphyllus*	-	-
Mammalia	Eastern Pygmy-possum	*Cercartetus nanus*	Vulnerable	-
Mammalia	Feathertail Glider	*Acrobates pygmaeus*	-	-
Mammalia	Fox	*Vulpes vulpes*	-	-
Mammalia	Gould's Wattled Bat	*Chalinolobus gouldii*	-	-
Mammalia	Greater Broad-nosed Bat	*Scoteanax rueppellii*	Vulnerable	-
Mammalia	House Mouse	*Mus musculus*	-	-
Mammalia	Kangaroo / wallaby	*Macropus sp.*	-	-
Mammalia	Large Bentwing-bat	*Miniopterus orianae oceanensis*	Vulnerable	-
Mammalia	Large Forest Bat	*Vespadelus darlingtoni*	-	-
Mammalia	Little Bentwing-bat	*Miniopterus australis*	Vulnerable	-
Mammalia	Little Broad-nosed Bat	*Scotorepens greyii*	-	-
Mammalia	Little Forest Bat	*Vespadelus vulturnus*	-	-
Mammalia	Little Mastiff-bat	*Mormopterus planiceps*	-	-
Mammalia	Long-eared bat	*Nyctophilus sp.*	-	-
Mammalia	Long-nosed Bandicoot	*Perameles nasuta*	-	-
Mammalia	Short-beaked Echidna	*Tachyglossus aculeatus*	-	-
Mammalia	Southern Forest Bat	*Vespadelus regulus*	-	-
Mammalia	Sugar Glider	*Petaurus breviceps*	-	-
Mammalia	Swamp Rat	*Rattus lutreolus*	-	-
Mammalia	Swamp Wallaby	*Wallabia bicolor*	-	-
Mammalia	unidentified Bandicoot	*Isoodon/Perameles sp.*	-	-
Mammalia	White-striped Freetail-bat	*Austronomus australis*	-	-
Mammalia	Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable	-
Reptilia				
Reptilia	Blotched Blue-tongue	*Tiliqua nigrolutea*	-	-
Reptilia	Dark-flecked Garden Sunskink	*Lampropholis delicata*	-	-
Reptilia	Eastern Blue-tongue	*Tiliqua scincoides*	-	-

Annexure B

Habitat assessment table

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Likelihood	Criteria

Habitat assessment table

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
Barking Owl	*Ninox connivens*	V		Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	The species rarely found at higher altitudes and the study area doesn't habitat for this species.	N	High	Yes - No habitat present to support the species.
Black stork	*Ephippiorhynchus asiaticus*	E	-	Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet	The study area doesn’t support habitat for this species.	N	High	No surveys required

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.				
Black-chinned Honeyeater	*Melithreptus gularis gularis*	V	-	In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions, though it is very rare in the latter.	The study area supports marginal habitat for this species.	N	Moderate	No surveys required
Blue Mountains Water Skink	*Eulamprus leuraensis*	E1	E	The species is restricted to isolated and naturally fragmented habitats of permanent sedge and hanging swamps (these develop at moderate to high altitudes on	Not present (surveyed) - The species is restricted to isolated and naturally fragmented habitats of permanent sedge and hanging swamps (these	N	High	Yes - Targeted surveys in hanging swamp habitat during (December 2021), confirmed absence.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				sloping rock faces composed of Narrabeen sandstone which are subject to a constant supply of water), in open forest and open scrub or heath.	develop at moderate to high altitudes on sloping rock faces composed of Narrabeen sandstone which are subject to a constant supply of water), in open forest and open scrub or heath. The habitat within the study area supports marginal habitat for this species in the form of wet gully forest. Furthermore, higher quality habitat may persist in the area we didn't have access to for the previous round if surveys (K2MB-2 area between Explorers Road and Foy Avenue).			
Blue-billed Duck	*Oxyura australis*	V	-	Widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation.	The study area doesn't support habitat for this species.	N	High	No surveys required
Booroolong Frog	*Litoria booroolongensis*	E1	E	The Booroolong Frog is found along permanent western flowing streams of	Low - The species occupies streams ranging from small slow-flowing creeks	N	High	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				the Great Dividing Range through most of NSW and down into northern Victoria. Streams range from small slow-flowing creeks to large rivers and the adults are found on or near cobble banks and other rock structures within stream margins and shelter under rocks or amongst vegetation near the ground on the stream edge. The species occurs along streams in both forested areas and open pasture but has been affected by the presence of the introduced willow tree. Booroolong Frogs sometimes basks in the sun on exposed rocks near flowing water during summer.	to large rivers and the adults are found on or near cobble banks and other rock structures within stream margins and shelter under rocks or amongst vegetation near the ground on the stream edge. The species occurs along streams in both forested areas and open pasture but has been affected by the presence of the introduced willow tree. The study area does not support habitat suitable for this species.			
Broad-headed Snake	*Hoplocephalus bungaroides*	E1	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock.	High - This species shelters under rocks and crevices during the late summer to early spring, as conditions warm up it shifts to using hollows in trees - often in sandstone gully forest just downslope from the outcrops. The study area does not support sandstone outcropping, overhangs and crevices. The species is likely to occur in higher	N	High	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	quality escarpment habitat to the west and/or east of the study area.			
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V		Found in eucalypt woodlands (including box-gum woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and river red gum forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	High - Found in eucalypt woodlands (including box-gum woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range. Species confirmed present during diurnal survey work.	Y	High	Yes – incidental observation in the MB2BH area. Doesn't require further consideration.
Brush-tailed Phascogale	*Phascogale tapoatafa*	V		The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it	This species has not been recorded within 10 kilometres of the study area previously. Prefers	N	High	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				is mainly found east of the Great Dividing Range although there are occasional records west of the divide. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest, and wet sclerophyll forest.	dry and open sclerophyll forests. No incidental observations of phascogales were undertaken during nocturnal surveys and Spring camera trapping. Therefore, considered highly unlikely to be occupying the study area.			
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland, and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	Low. The study area does not support the highly specialised habitat requirements for this species. Found in rocky areas in a wide variety of habitats including rainforest gullies and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves, and crevices.	N	High	Yes - No habitat present to support the species.
Bush Stone-curlew	*Burhinus grallarius*	E1		The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and, in the south-east, it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and	Species is mainly found in western slopes and plains and the Riverina, smaller numbers on Central and North Coast with increasing numbers in Tweed Valley. It may be easier to detect during breeding season, possibly calls all year, but it is unclear how well it responds to playback. The species was allocated to a species credit as	N	Moderate to high	Yes - Marginal habitat present, however, no individuals encountered.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				fallen timber. Largely nocturnal, being especially active on moonlit nights.	experts determined that it cannot be predicted to occur at a site based on vegetation surrogates but can be detected reliably from survey. Marginal habitats present on the outer edges of study area where the understorey has been managed less. No individuals identified during nocturnal surveys.			
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	The South-eastern Long-eared Bat has a limited distribution that is restricted around the Murray-Darling Basin in south-eastern Australia. Even in this region its distribution is scattered and it is rarely recorded. It occurs in far eastern South Australia, in areas north of the Murray River, east of Canegrass Station and south of the Barrier Highway. These areas include the Riverland Biosphere Reserve, Danggali Conservation Park and the Birds Australia Gluepot Reserve. It is distributed throughout inland NSW except in the north-west area which is dominated by treeless plains. It	It is distributed throughout inland NSW except in the north-west area which is dominated by treeless plains. The study area does not support habitat for this species.	N	High	No surveys required

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				can be found in the Hunter Valley, extending from central NSW to the eastern Hunter Valley coast. Considered *Nyctophilus timorensis* south eastern form under TSC Act.				
Diamond Firetail	*Stagonopleura guttata*	V		Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	The study area supports potential habitat for this species.	N	Moderate	No surveys required
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V		Dusky wood swallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily	The study area supports potential habitat for this species.	N	Moderate	No surveys required

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris.				
Eastern Cave Bat	*Vespadelus troughtoni*	V		The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. No breeding habitat present within the study area.	N	Moderate to high	Yes - No roosting habitat present to support the species.
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	V		Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is	Recorded during spring surveys in the M2B study area.	Y	High	No surveys required

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				known of this species' habits.				
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	The study area supports habitat for this species.	N	Moderate	No surveys required
Eastern Pygmy-possum	*Cercartetus nanus*	V		Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area	Recorded - Confirmed present during camera trapping (Summer 2021). Eastern pygmy-possum relies on proteaceous and myrtaceous shrubs and trees are a favoured food source. Individuals will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has	N	High	Yes – Eastern Pygmy-possum confirmed present (December 2021).

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				over a 5-month period.	been recorded using up to 9 nest sites within a 0.5ha area over a 5-month period. No individuals were identified during camera trap deployment (Spring 2020) and no incidental sightings during nocturnal surveys. Habitat for this species is most likely in area east and west of the current road alignment where less under scrubbing/vegetation management of the lower stratum layers and higher abundance diversity of foraging resources.			
Flame Robin	*Petroica phoenicea*	V		Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The species is also found in Tasmania. The preferred habitat in summer includes eucalyptus forests and woodland, whilst in winter prefers open woodlands and farmlands. It is considered migratory. The Flame Robin breeds from about August to January.	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. During Summer, the nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks.	N	Moderate	No surveys required
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V		In summer, occupies tall montane forests and woodlands,	Recorded – foraging habitat only. The species was	Y - Foraging	Moderate	Yes - No breeding habitat confirmed for this species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine snow gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	identified flying above the canopy during spring 2020 surveys. There is an area within the mid-section of MB2BH area which supports large trees with hollows at a minimum height of 9 metres and a diametre of 10 cm. Given that individuals have already been identified utilising the study area during breeding season (Spring 2020), it is likely that there may be breeding habitat within the vicinity of the study area. Individuals weren't identified during winter surveys and this typical behaviour for this species as they usually occupy areas at lower elevations during the cooler months.			
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	Species is dependent on hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin.	Low - The species requires hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin. The study area does not support breeding and non-breeding habitat for this species.	N	High	No habitat present to support the species.
Giant Dragonfly	*Petalura gigantea*	E	-	The Giant Dragonfly is found along the east coast of NSW from the Victorian	Low - This species is highly associated with upland swamp habitat. The only	N	Moderate	Yes - Targeted surveys completed in December 2021. The study area does

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence.	area in the study area where the species may occur is in the K2MB-2 section of the study area.			not support habitat for this species.
Gilbert's Whistler	*Pachycephala inornata*	V		Recorded in mallee shrublands, but also occurs in box-ironbark woodlands, cypress pine and belah woodlands and river red gum forests, though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including wattles, hakeas, sennas and hop-bushes.	The study area supports potential habitat for this species.	N	Moderate	No surveys required
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V		Inhabits forest with low nutrients, characteristically with key Allocasuarina spp.	Moderate - Lack of suitable foraging resources within the study area (e.g. Black She oak). In	N	High	Yes - No breeding habitat present for this species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	accordance with the requirements of the BAM, no signs of breeding were identified within the study area. No individuals identified. If individuals were identified and breeding within the study area you would typically observe begging/territorial behaviour or solitary males. Furthermore, the habitat assessment identified less than three trees within the entire study area (mid-MB2BH area) which were remotely suitable as nesting habitat for the species (10 cm diameter hollow between 8 - 9 metre high). The requirements of the BAM outline (ii) in stems with a diameter of at least 30 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees and may be near-vertical or vertical. Given that we conducted multiple days of surveys during the peak of breeding season and didn't identify any individuals nor signs of breeding habitat. It is highly likely that this species is not			

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
					using the study area as breeding habitat.			
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	Recorded. The study area supports habitat for this species.	Y	High	Yes
Greater Glider	*Petauroides volans*		V	The Greater Glider occurs in eucalypt forests and woodlands. The Greater Glider occurs in eucalypt forests and woodlands. The species nests in hollows and are typically found in older forests. Generally the home range for the greater glider is between 0.7-3 ha and tends to have a population density of 0.01-5 individuals per hectare. The home ranges of females can overlap with males and females however for the males the home ranges never overlap.	Multiple records south-west of the study area (near Megalong Valley). The species is allocated to species credit because it occurs across a broad range of vegetation types and can be reliably detected from survey. The species requires a high density of suitable sized hollows within its range. No individuals were identified during nocturnal survey work, however, climatic conditions were poor at the time of survey.	N	Low to moderate	Yes - surveyed in Winter and Spring 2021.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
Grey Falcon	*Falco hypoleucos*	E	V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	Low - Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. The study are does not support habitat for this species.	N	High	Yes - No habitat present to support the species.
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V		In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open box-gum woodlands on the slopes, and box-cypress-pine and open box woodlands on alluvial plains.	The study area does not support habitat for this species in the form of open box-gum woodlands on the slopes, and box-cypress-pine and open box woodlands on alluvial plains.	N	High	No surveys required
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats	Moderate - Field surveys during Spring and Winter did not identify any established camps within the study area. May use on occasion as a foraging resource.	Y - Foraging only	High	Foraging habitat only.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	Closest camp is in St Marys (35 kilometres east of the study area).			
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V		Occupy a wide range of eucalypt woodlands, Acacia shrublands and open forests.	The study area supports potential habitat for this species.	N	Moderate	No surveys required
Inland Forest Bat	*Vespadelus baverstocki*	V		Roosts in tree hollows and abandoned buildings. Known to roost in very small hollows in stunted trees only a few metres high. The habitat requirements of this species are poorly known but it has been recorded from a variety of woodland formations, including mallee, mulga and river red gum. Most records are from drier woodland habitats with riparian areas inhabited by the Little forest Bat. However, other habitats may be used for foraging and-or drinking.	Most records are from drier woodland habitats with riparian areas inhabited by the Little forest Bat. The study area does not support habitat for Inland Forest Bat.	N	High	No surveys required
Koala	*Phascolarctos cinereus*	V	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate, and rainfall.	Moderate -The study area is 15 km west of Blaxland Area of Regional Koala Significance (within traversing range; particularly during breeding season). Last known record was in 2015 towards Leura area. In the Central and	N	High	Yes – over 42 person hours of spotlighting completed.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
					Southern Tablelands, Ribbon Gum (Eucalyptus viminalis; Primary food tree) and Brittle Gum (Eucalyptus mannifera; secondary food tree) were identified in low densities in the eastern portion of the MB2BH footprint. No distinctly identifiable Koala scats have been identified during diurnal work. Furthermore, no individuals have been identified during nocturnal work or camera trap deployment.			
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	-	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings, and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Recorded - Acoustically recorded in the southern portion of the MB2BH area. This species is retained as dual credit because foraging habitat is broad ranging, but breeding habitat is highly specific. Large Bentwing-bat has complex roosting ecology and tends to utilise different roost types at different times of the year. During winter, females and males congregate in smaller colonies, which may occur in human made structures such as old mines, stormwater channels	Y - Foraging/ Roosting. Not breeding	High	Yes - Foraging habitat only.

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					and disused buildings. These roosts are usually cool, which enables individuals to enter hibernation (can be up to 12 days at a time between feeds) to conserve energy when food sources are low. Mating takes place in late autumn or early winter (Dwyer 1995). Females are fertilised late autumn/early winter, but copulation doesn't take place until shortly before the females emerge from hibernation in August. Females occupy the over-wintering roosts (like culverts) until they migrate in September when they move to maternity roosts (Dwyer 1963). During these migrations, females have been recorded moving at least 70 kilometres overnight between roosts. A distance of several hundred kilometres may be travelled between over-wintering sites and maternity roosts. In some cases, acclimatisation roosts may be used prior to the females moving to their maternity roosts. These roosts are			

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					believed to assist bats to adjust to the high humidity that is experienced in the maternity roost for creching young (Hoye and Spence 2004). Furthermore, only three major maternity roosts are known in New South Wales, Willi Willi caves near Kempsey, Drum Cave at Bungonia near Goulburn, and Church Cave at Wee Jasper (Hamilton Smith and Dwyer 1965). All three roosts occur in limestone karst systems and are located in domed caverns where the great number of bats elevate both temperature and humidity and in turn speed development of the young (Dwyer 1971). It is likely that unknown maternity roosts exist within the vicinity of Sydney (Wilson 2000).			
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and	Moderate.No individuals were acoustically recorded during Spring surveys. The species is likely to occupy higher quality habitat within the escarpment areas (abundance of karst habitats/overhangs)	N	High	Yes - No habitat within the subject site and no calls recorded during spring survey.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				mines in groups of between 3 and 37 individuals.	to the east and west of the study area.			
Little Bent-winged Bat	*Miniopterus australis*	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel 100s km from feeding home ranges to breeding sites. Little Bent-wing Bat prefers moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	Recorded - Acoustically recorded in the southern portion of the MB2BH area. The species has similar breeding/roosting ecology to Large Bentwing-bat and are often found co-roosting (Dwyer 1968). In NSW the largest maternity colony is in close association with a large maternity colony of Large Bentwing-bat and appears to depend on the large colony to provide the high temperatures needed to rear its young. None are known in the greater Sydney region.	Y - Foraging/ Roosting. Not breeding	High	Yes - Foraging habitat only.
Little Eagle	*Hieraaetus morphnoides*	V		Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland, and forest in tall trees.	High - The habitat assessment did not identify the presence of any suitable canopy stick nests within the study area. In accordance with the BAM, breeding habitat is live (occasionally dead) large old trees within suitable vegetation AND the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top	N	High	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
					half of the tree canopy.			
Little Lorikeet	*Glossopsitta pusilla*	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	The study area supports habitat for this species.	N	Moderate	No surveys required
Little Pied Bat	*Chalinolobus picatus*	V		The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, Bimbil box. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings.	Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. The species wasn't recorded during summer surveys and habitat is considered marginal for this species within the subject site.	N	High	No surveys required

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
Littlejohn's Tree Frog	*Litoria littlejohni*	V	V	Occurs in wet and dry sclerophyll forests and heathland associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range from the Central Coast down into Victoria. Individuals have been collected from a wide range of water bodies that includes semi-permanent dams, permanent ponds, temporary pools and permanent streams, with calling occurring from fringing vegetation or on the banks. Individuals have been observed sheltering under rocks on high exposed ridges during summer and within deep leaf litter adjacent to the breeding site. Calling occurs in all months of the year, often in association with heavy rains. The tadpoles are distinctive, being large and very dark in colouration.	Low. The species requires permanent streams and perched swamps. The study area doesn't support habitat suitable for this species. No habitat suitable for this species exists within the subject site	N	High	Yes - the study area does not support habitat for this species.
Masked Owl	*Tyto novaehollandiae*	V		Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open	Low. Dead stags are especially popular for roosting/breeding habitat and are a limited resource due to natural attrition. The study area didn't support breeding	N	High	Yes - No breeding habitat present for this species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls' prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	habitat in the form of large dead stags. Furthermore, during nightwork noise levels were consistently between 70 - 80 dB (noise levels typically of busy traffic). Individuals are likely to establish territories within areas that are more protected and with lower noise levels for breeding. No distinct calls were heard at dusk or during spotlighting.			
New Holland Mouse	*Pseudomys novaehollandiae*	-	v	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	The study area supports marginal habitat for this species. Typically found at lower altitudes towards the coast (below 600 m asl).	N	Low	No surveys required
Pale-headed Snake	*Hoplocephalus bitorquatus*	V		The Pale-Headed Snake has a patchy distribution from north-east Queensland to north-east NSW. In NSW it occurs from the coast to the western side of the Great Divide as far south as Tuggerah and out to the	The species is found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest where it favours streamside areas, particularly in drier habitats. They	N	High	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				western plains. It is found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest where it favours streamside areas, particularly in drier habitats. They shelter during under loose bark or in hollows and have a preference for frogs as prey, although lizards and small mammals are also taken. This species breeds and shelters in hollows in live and dead trees and in and under fallen timber. It is best detected from mid spring to mid autumn and is mostly nocturnal.	shelter during under loose bark or in hollows and have a preference for frogs as prey, although lizards and small mammals are also taken. This species breeds and shelters in hollows in live and dead trees and in and under fallen timber. It is best detected from mid spring to mid-autumn and is mostly nocturnal. This species prefers moist habitats where there is higher attractant of amphibian prey and small reptiles. The study area does not support habitat for this species.			
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by kangaroo grass. Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.	Inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by kangaroo grass. The study area doesn't support habitat suitable for this species.	N	High	Yes - No habitat present to support the species.
Powerful Owl	*Ninox strenua*	V		Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it	Low. No extra-large hollows (>20 diameter) to support breeding individuals were identified within the study area. Furthermore, no butcher sites	N	High	Yes - No breeding habitat present for this species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	(pellets, kills, whitewash), no individuals were identified at dusk or during nocturnal survey work to signify breeding habitat. Furthermore, during nightwork noise levels were consistently between 70 - 80 dB (noise levels typically of busy traffic). Individuals are likely to establish territories within areas that are more protected and with lower noise levels for breeding. No distinct calls were heard at dusk or during spotlighting.			
Purple Copper Butterfly, Bathurst Copper Butterfly	*Paralucia spinifera*	E1	V	The Copper Butterfly is only found in the Central Tablelands of NSW. Its habitat is restricted to elevations above 900 m where it feeds exclusively on a form of blackthorn. The butterfly's life cycle relies on a 'mutualistic' relationship with the ant Anonychomyrma itinerans, and on the presence of blackthorn (Bursaria spinosa subsp. lasiophylla).	Low - During the habitat assessment a couple of anomalous Bursaria spinosa spp. Were identified in the southern most portion of the MB2BH area in a shaded gully. Canopy was tall and shaded this area significantly and the gully was north-east facing (the species typically prefers a south-west to north-west aspect, with direct sunlight). Based on habitat requirements for this species. These couple of plants can	N	High	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
					be discounted as habitat for Purple Copper Butterfly.			
Red-crowned Toadlet	*Pseudophryne australis*	V		Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After raining these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	Low - Marginal habitat present within the study area. Some ephemeral drainage lines, however, no permanent soaks with sandstone geologies and adequate pooling habitat to support this species.	N	High	Yes - No habitat present.
Regent honeyeater	*Anthochaera phrygia*	CE	CE	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted	Vagrant foraging habitat only. Not mapped within the important areas mapping for the species (BOAMS portal, 2021).	N	Moderate to high	Yes - No important habitat mapped within the study area.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal woodlands and forests.				
Rosenberg's Goanna	*Varanus rosenbergi*	V		This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	The study area supports potential habitat for this species.	N	Moderate	No surveys required
Scarlet Robin	*Petroica boodang*	V		The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The	Some portions of the study area may be suitable where there has been previous disturbance to the lower stratums and succession has made the habitat more favourable for this species.	N	Moderate	No surveys required

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				understorey is usually open and grassy with few scattered shrubs.				
Sooty Owl	*Tyto tenebricosa*	V		Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. The study area does not support habitat for this species.	N	High	Yes - No habitat present to support the species.
Southern Brown Bandicoot (eastern)	*Isoodon obesulus obesulus*	E	E	Prefers sandy soils with scrubby vegetation and-or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	Moderate - The study area supports moderate quality habitat in the form of ground and lower stratum flora species for habitat. Areas within the alignment have been previously cleared or managed. However, within the MB2BH area, portions of moderate condition PCT 1248 between Foy Avenue and Delmonte provide moderate quality shrubby, woody debris habitat for this species to occupy, however, good quality habitat is fragmented within the existing alignment and Feral species such as Red	N	High	Yes - Remote camera deployment in most areas of higher quality habitat and eight nights of spotlighting.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
					Fox, Domestic Dog/Cat are quite active (evident from camera trapping data). The location of the study area is within the most western portion of this species known range. Long-nosed Bandicoot was confirmed as present during spring surveys in the MB2BH area, however, both bandicoot species are sympatric in distribution.			
Southern Myotis	*Myotis macropus*	V	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	Low - This species has a high affinity with permanent water sources (almost always roosting within 200 - 500 metres). The study area does not support suitable roosting/foraging habitat for this species. Furthermore, the species wasn't recorded during acoustic surveys.	N	High	Yes - No habitat present to support the species. Not identified during targeted surveys.
Speckled Warbler	*Chthonicola sagittata*	V	-	The Speckled Warbler lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt	The study area supports low quality habitat for this species	N	Moderate	No surveys required

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				regrowth and an open canopy.				
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	The southern portion of the study area towards Nellies Glen Road support potential habitat for this species (previous records in the locality). No direct or indirect signs of presence identified during field campaigns.	N	Moderate	Terrestrial camera traps deployed during spring surveys.
Square-tailed Kite	*Lophoictinia isura*	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by *Eucalyptus longifolia, Corymbia maculata, E. elata or E. smithii.* Individuals appear to occupy large hunting ranges of more than 100km2. They require large living trees for breeding, particularly near water with surrounding woodland -forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	High - The species require large living trees for breeding, particularly near water with surrounding woodland -forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs. The study area didn't support breeding/Nesting habitat for this species in the form of large canopy nests.	N	High	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
Squirrel Glider	*Petaurus norfolcensis*	V		Generally, occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	Moderate - Moderate quality habitat present within the MB2BH area and K2MB. Moderate hollow density, however, nocturnal noise levels range between 70 - 80 dB within the study area and edge effects evident. No activity observed during the current spotlighting efforts (June 2021). No smooth-barked Eucalypt species in flower at the time of the assessment.	N	High	Yes – over 42 person hours of spotlighting completed.
Striped Legless Lizard	*Delma impar*	V	V	Found mainly in natural temperate grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near natural temperate grassland and occasionally in open box-gum woodland. Sometimes found in grasslands with significant amounts of surface rocks,	The species inhabits large open areas of Tussock Grass. The study area doesn't support habitat suitable for this species.	N	High	Yes - No habitat presents to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				which are used for shelter.				
Stuttering Frog	*Mixophyes balbus*	E1	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water.	Species typically found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Therefore, no habitat present within the study area.	N	Low	Yes - No habitat present to support the species.
Swift Parrot	*Lathamus discolor*	E	CE	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to	Opportunistic foraging during migratory efforts. No individuals identified within the study area during diurnal fieldwork in early June 2021.	N	Moderate	Yes - Opportunistic foraging present. No individuals identified during June 2021 surveys.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				changing food availability.				
Turquoise Parrot	*Neophema pulchella*	V		The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. The study area supports marginal habitat for this species.	N	High	No surveys required
Varied Sittella	*Daphoenositta chrysoptera*	V		Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbark's, but also in paperbarks or mature Eucalypts with hollows.	The study area supports potential habitat for this species.	N	Moderate	No surveys required
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	-	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	Moderate - Breeding habitat is live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest	N	High	Yes - the study area does not support habitat for this species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
					within tree canopy; or an adult with nest material; or adults observed duetting within breeding period. Due to the similarities in nest structure and use of the same nests by White-bellied Sea Eagles and Wedge-tailed Eagles, where a nest is observed without a bird present, searches for prey remains/feathers below the structure should be undertaken. The differing diets of both species and distinctive adult feathers, should provide evidence of nest use, however; where prey items/feathers are absent, repeat visits to the nest until a bird is observed should be undertaken. The habitat assessment did not identify butcher sites, feathers or any large canopy sticknests in large old trees to suggest the species is utilising the study area as habitat.			
White-throated Needletail	*Hirundapus caudacutus*	-	V	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. No habitat present for the species within the study area.	N	Moderate to high	Yes - No habitat present to support the species.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
Yellow-bellied Glider	*Petaurus australis*	V		Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Not encountered during surveys.	N	Low	Yes – 52 person hours of nocturnal surveys completed.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V		Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	The study area supports potential habitat for this species.	N	Moderate	No surveys required
Flora								
Acacia baueri subsp. *aspera*	*Acacia baueri subsp. aspera*	V	-	Occurs in low, damp heathlands, often on exposed rocky outcrops over a wide range of climatic and topographical conditions. Appears	The study area has small areas that support potential habitat for this species.	N	Moderate	Yes - surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				to prefer open conditions; rarely observed where there is any shrub or tree canopy development; and many of the observations of this species have been made following fire, suggesting the species prefers early successional habitats. Restricted to the Sydney region, occurring on the Kings Tableland in the central Blue Mountains and with sporadic occurrences on the Woronora Plateau in the Royal National Park, Mt. Keira district and at Wedderburn. May also occur on the escarpment-Woronora Plateau in the Flat Rock Junction and Stanwell Tops area of the Illawarra.				
Acacia clunies-rossiae	*Acacia clunies-rossiae*	V	-	Grows in the Kowmung and Coxs River areas entirely within Kanangra-Boyd and Blue Mountains National Parks. Grows in dry sclerophyll forest on skeletal soils on rocky slopes, or on alluvium along creeks.	No habitat present within the study area.,	N	Moderate	Yes - No habitat present within the study area
Acacia gordonii	*Acacia gordonii*	E	E	Restricted to the north-west of Sydney, with a disjunct distribution occurring in the	Not present (surveyed) - Occurs at lower altitudes within the Blue Mountains region.	N	High	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				lower Blue Mountains in the west, and in the Maroota-Glenorie area in the east. Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops.	Requires rocky outcropping. Also lack of suitable habitat in study area.			
Acacia meiantha	*Acacia meiantha*	E1	E	It is found in three disjunct populations, all within the Central Tablelands and within 100kms of each other. These populations include Clarence, which covers an area of approximately 1 hectare; Mullions Range, covering approximately 5 ha; and Aarons Pass, which is confined to 2.5km of road easements. Open eucalyptus forest/woodland - 3 populations slghtly different dominant species etc.	High restrictive habitat requirements (isolated populations). Highly unlikely to occur with subject site.	N	High	Yes -surveyed (Spring)
Acrophyllum australe	*Acrophyllum australe*	V	V	Restricted distribution, occurring from Faulconbridge to Lawson, South of Bilpin and near Kings Tableland, in the Blue Mountains area. Grows in sheltered gullies beneath waterfalls and drip zones of rock overhangs and cliff faces, usually with a south-east to south-west aspect. Typically found in	Restricted to escarpment area. No habitat present within the study area.	N	Moderate	Yes - No habitat present within the study area

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				areas where there is a more or less constant supply of water. Usually grows in shale interbeds at the base of small cliffs, in crevices on the sandstone rock face or on talus slopes. The rock overhangs are of Hawkesbury or Narrabeen Sandstone. Associated species commonly include Callicoma serratifolia, Dracophyllum secundum, Todea barbata, Allania endlicheri and Blechnum ambiguum. Found adjacent to open forest of Eucalyptus piperita and Angophora costata and closed forest of Doryphora sassafras and Ceratopetalum apetalum. Frequently growing on very thick layers of moss.				
Asterolasia buxifolia	*Asterolasia buxifolia*	E1		Known from a single site at a granite outcrop in the riparian zone of the Lett River. Apparently restricted to dense riparian scrub along rocky watercourses with a granitic substrate.	Restricted to escarpment area. No habitat present within the study area.	N	Low	Yes - No habitat present within the study area
Ausfeld's Wattle	*Acacia ausfeldii*	V		Found to the east of Dubbo in the Mudgee, Ulan - Gulgong area of the NSW South Western	The study area doesn't support habitat for this species.	N	Moderate	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				Slopes bioregion, with some records in the adjoining Brigalow Belt South, South Eastern Highlands and the Sydney Basin bioregions. Associated species include Eucalyptus albens, E. blakelyi and Callitris spp., with an understorey dominated by Cassinia spp. and grasses.				
Black gum	*Eucalyptus aggregata*	V	V	Found in the NSW Central and Southern Tablelands, with small, isolated populations in Victoria and the ACT. Has a moderately narrow distribution, occurring mainly in the wetter, cooler and higher parts of the tablelands in the lowest parts of the landscape, on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Also occurs as isolated paddock trees in modified native or exotic pastures.	The study area doesn't support habitat for this species.	N	High	Yes -surveyed (Spring)
Blue Mountains - Shoalhaven Hanging Swamps	*Prickly Tea-tree - sedge wet heath on sandstone plateaux, central and southern Sydney Basin Bioregion*	V	E	The Blue Mountains Swamps community is typically associated with the poorly drained headwaters of streams on the predominantly	Recorded - Field surveys identified the absence of BMS within the M2B study area, however, potential to occur in areas that couldn't	N	High	Yes – confirmed present.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				sandstone plateaux of the Blue Mountains. High levels of soil moisture result from the combination of high rainfall (typically exceeding an average of 1000 mm per annum), relatively slow runoff and low subsurface permeability. The Blue Mountains Swamps community spans an altitudinal range of approximately 500 to 950 m above sea level. With increasing elevation, the Blue Mountains Swamps community intergrades with Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion, which is currently listed as an Endangered Ecological Community under the BC Act. The transition occurs around Bell and Clarence at approximately 850-950 m above sea level. The Blue Mountains Swamps community typically has a reduced cover of shrubs and a greater cover of sedges (particularly Gymnoschoenus sphaerocephalus).	be accessed in the K2M study area.			
Blue Mountains Cliff Eyebright	*Euphrasia bowdeniae*	V	V	This species in known to occur at 750 m asl but is	Restricted to escarpment area. No habitat present	N	High	Yes - No habitat present within the study area.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				likely to occur up to 1000-1100 m asl. It is found on vertical sandstone cliffs, in very shallow soil on rocky ledges, or trailing over steep exposed rocks.	within the study area.			
Bristly Shield Fern	*Lastreopsis hispida*	E	-	This species may be difficult to distinguish from other members of its genus and confirmation of its identity may require a fern specialist. The species is rare in NSW with the only recent confirmed records from Mt Wilson in the Blue Mountains. Also occurs in southern Victoria and Tasmania and is common in New Zealand. Grows in moist humus-rich soils in wet forest and rainforest gullies.	The subject site has minimal suitably-mesic habitat available for this species. No records since 1980's. Has been confused with similar species. Requires voucher to identify.	N	Low	Yes - no individuals identified during targeted surveys.
Brown Pomaderris	*Pomaderris brunnea*	E1	V	The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. Found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area. It also occurs at Walcha on the New England Tableland and in far eastern Gippsland in Victoria.	No habitat present within the study area.,	N	Moderate	Yes -surveyed (Spring)
Buttercup Doubletail	*Diuris aequalis*	E1,2	V	Recorded in Kanangra-Boyd	The study area doesn't support	N	Moderate	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				National Park, Gurnang State forest, towards Wombeyan Caves, the Taralga - Goulburn area, and the ranges between Braidwood, Tarago and Bungendore. Grows in forest, low open woodland with grassy understorey and secondary grassland on the higher parts of the Southern and Central Tablelands.	habitat for this species.			
Bynoe's Wattle	*Acacia bynoeana*	E1	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Not present (surveyed) - The habitat within the study area does not appear to be associated with the typical habitat requirements of this species. Appears to be distributed at slightly lower altitudes.	N	High	Yes -surveyed (Spring)
Callistemon purpurascens	*Callistemon purpurascens*	CE	CE	Only known from the swampy riparian zone of two	Highly specialised habitat requirements and only known to	N	Moderate to high	Yes - No habitat present within the study area.

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				unnamed tributaries of Megalong Creek below the Blue Mountains Plateau. Swampy, mostly riparian shrubland, swamp woodland and swamp forest with emergent *Melaleuca linariifolia, M. styphelioides and Eucalyptus camphora. Leptospermum species* are often dominant in the midstorey.	occur in a few locations in very few numbers. Habitat isn't suitable for this species within the study area.			
Cambage Kunzea	*Kunzea cambagei*	V	V	Cambage Kunzea is restricted to damp, sandy soils in wet heath or mallee open scrub at higher altitudes on sandstone outcrops or Silurian group sediments. It mainly occurs in the western and southern parts of the Blue Mountains, NSW, mainly the Yerranderie/Mt Werong area, with four main populations with 20 to 150 individuals.	The study area has small areas that support potential habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Capertee Stringybark	*Eucalyptus cannoni*	V	-	Restricted to an area of about 100 by 60 km in the central tablelands of NSW. The western border is approximately marked by a line between Bathurst and Mudgee, while the eastern locations occur approximately on a line between Lithgow and the town of Bylong.	Not present (surveyed) - Recorded from Tablelands Grassy woodland Complex communities and Talus Slope woodlands. Occurs near Lithgow.	N	High	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				Within this area the species is often locally frequent. Recorded from Tablelands Grassy woodland Complex communities and Talus Slope woodland, and in Winburndale Nature Reserve within woodland dominated by *Eucalyptus macrorhyncha* and *Eucalyptus goniocalyx.*				
Clandulla Geebung	*Persoonia marginata*	V	V	Grows in dry sclerophyll forest and woodland communities on sandstone. Appears to respond well to disturbance, with greater densities found along the edges of tracks and in areas disturbed by forestry activities.	Not present (surveyed) - The species is highly reliant on sandstone geologies. Not known in areas with granitic and basalt influence.	N	High	Yes -surveyed (Spring)
Cotoneaster Pomaderris	*Pomaderris cotoneaster*	E	E	Cotoneaster Pomaderris has a very disjunct distribution and has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.	The study area doesn't support habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Coveny's Zieria	*Zieria covenyi*	E	E	Has been recorded from only one location, Narrow Neck Peninsula within Blue Mountains National	No habitat available within the study area.	N	High	Yes - No habitat present within the study area

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				Park, south-west of Katoomba in the Central Blue Mountains. Two populations on Narrow Neck Peninsula have been detected, several kilometres apart. Both consist of approximately 100 and 170 individual stems. Occurs in open sclerophyll forest dominated by Eucalyptus sieberi. The species occurs on gentle east and south-facing slopes and on ridges in shallow sandy soil.				
Darwinia peduncularis	*Darwinia peduncularis*	V	-	Occurs as local disjunct populations in coastal NSW with a couple of isolated populations in the Blue Mountains. It has been recorded from Brooklyn, Berowra, Galston Gorge, Hornsby, Bargo River, Glen Davis, Mount Boonbourwa and Kings Tableland. Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone.	Not present (surveyed) - Restricted to drip lines and rocky sandstone outcrops. The subject site does not support habitat for this species. Also lack of suitable habitat in study area.	N	High	Yes -surveyed (Spring)
Deane's Boronia	*Boronia deanei*	V	V	Scattered populations occur between the far south-east of NSW and the Blue Mountains (including the upper Kangaroo River near Carrington Falls, the Endrick River near	The study area has small areas that support potential habitat for this species.	N	Moderate	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				Nerriga and Nalbaugh Plateau), mainly in conservation reserves. Grows in wet heath, often at the margins of open forest adjoining swamps or along streams.				
Duramana Fingers	*Caladenia attenuata*	E2	CE	Caladenia attenuata is endemic to NSW. It has a highly restricted distribution, having been recorded from 2 localities within the Bathurst Ilford region with an area of occupancy estimated to be 8 square kilometres. Recent surveys have only found an unconfirmed specimen from the Ilford site.	The study area doesn't support habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Dwarf Mountain Pine	*Pherosphaera fitzgeraldii*	E	E	All currently-known populations occur in the upper Blue Mountains between Wentworth Falls and Katoomba, a range of nine kilometres. Pre-1950 records occur at Katoomba Falls, Leura Falls and Bonnie Doon Falls. Found within the spray zone or associated drip lines and seepage areas of waterfalls on steep, sandstone cliffs and ledges, at altitudes between 680 and 1000 metres above sea level. The sites face south-east to south-	Not present (surveyed) - The species has highly restricted known habitat and is only known to occur in the Wentworth Falls area of the Blue Mountains. Restricted to drip lines and seepage areas of waterfalls.	N	High	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				west and being on near-vertical to vertical slopes or under overhangs, are heavily shaded. The degree of shading from other plants varies from none on exposed cliffs and ledges to up to 70% from nearby rainforest plants on larger, lower ledges and overhang caves.				
Epacris hamiltonii	*Epacris hamiltonii*	E	E	Occurs in the Blue Mountains, west of Sydney. Found at 72 sites within three creek catchments. The creeks occur in an altitude range of 810-940 metres a.s.l. and are all located on the northern side of the escarpment and flow into the Grose Valley. All known sites occur within a radius of approximately 5 km. Has a very specific habitat, being found on or adjacent to Narrabeen sandstone cliffs alongside perennial creeks, often below plateau hanging swamps. The soil generally has a spongy-peat-like consistency, with a very high moisture content. Sites are found at the sheltered base of cliffs adjacent to wet gully or swamp	All known sites occur within a radius of approximately 5 km. Has a very specific habitat, being found on or adjacent to Narrabeen sandstone cliffs alongside perennial creeks, often below plateau hanging swamps. The soil generally has a spongy-peat-like consistency, with a very high moisture content. Sites are found at the sheltered base of cliffs adjacent to wet gully or swamp vegetation, usually where a perennial or virtually perennial source of water, such as cliff seepages, is present. Habitat within the study area was marginal. No individuals identified during threatened flora searches.	N	High	Yes - surveyed in accordance with the threatened flora species survey guidelines

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				vegetation, usually where a perennial or virtually perennial source of water, such as cliff seepages, is present.				
Eucalyptus copulans	*Eucalyptus copulans*	E	E	Only one individual tree is currently known, on Council Reserve along Jamison Creek at Wentworth Falls in the Blue Mountains, NSW. A second tree nearby may also be E. copulans although it has not been formally identified as such. A larger population is thought to have occurred historically in the locality.	Not present (surveyed) - The species has highly restricted known habitat and is only known to occur in the Wentworth Falls area of the Blue Mountains.	N	High	Yes -surveyed (Spring and Winter)
Evans Grevillea	*Grevillea evansiana*	V	V	Grows in dry sclerophyll forest or woodland, occasionally in swampy heath, in sandy soils, usually over Hawkesbury sandstone.	Not present (surveyed) - Grows in dry sclerophyll forest or woodland, occasionally in swampy heath, in sandy soils, usually over Hawkesbury sandstone. Habitat suitable within the study area. However, no individuals identified.	N	High	Yes -surveyed
Evans Sedge	*Lepidosperma evansianum*	V	-	The species is currently known from 3 locations (at Blackheath and Wentworth Falls), where it occurs in a very restricted habitat. It is recorded to be rare to occasional to common at these locations. It is difficult to assess the	Currently known from wet cliff faces at Blackheath and Wentworth Falls, although due to the inaccessibility of its habitat, many more plants are likely to occur than have been recorded. No clifflines are within the subject site and therefore, highly	N	High	Yes -surveyed (Summer, November, and December)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				number of individuals at each location because of the rhizomatous habit of the species	unlikely for the species occur.			
Fletcher's Drumsticks	*Isopogon fletcheri*	V	V	Grows in dry sclerophyll forest and heath on sandstone; confined to sheltered moist positions on the escarpment in the Blackheath district of the Blue Mtns, rare.	Restricted to within 50 metres of escarpment area. No habitat present within the study area. Restricted to moist sheltered cliffs within the spay zone of a waterfall. Grows in dry sclerophyll forest and heath on sandstone and is confined to sheltered moist positions.	N	High	Yes - No habitat present within the study area
Flockton Wattle	*Acacia flocktoniae*	V	V	The species has isolated occurrences in the central tablelands of NSW. It grows in dry sclerophyll forest on sandstone at an altitude of 500–1000 m above sea level with an average annual rainfall of 800–1200 mm.	The Flockton Wattle is found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie).	N	Moderate	Yes -surveyed (Spring 2021 and Winter 2022)
Grevillea divaricata	*Grevillea divaricata*	E1		Known only from the type collection made in 1823 by Allan Cunningham, from "north of Bathurst". Specimen notes describe the plant as occurring frequently in dry open forest lands and as possibly growing on rocky river margins.	The study area doesn't support habitat for this species.	N	Moderate	No surveys required
Hairy Geebung	*Persoonia hirsuta*	E	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of	Not present (surveyed) - The study area supports marginal habitat for this species in the form of dry sclerophyll forest,	N	High	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				occurrence, but occurs in small populations, increasing the species' fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other Persoonia spp. are) but will regenerate from seed.	however, the soils are primarily sandy clay loam.			
Hygrocybe anomala var. ianthinomarginata	*Hygrocybe anomala var. ianthinomarginata*	V	-	Occurs in gallery warm temperate forests dominated by lily Pilly, grey myrtle, cheese tree and sweet pittosporum. Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	Primarily restricted to Hawkesbury Sandstone vegetation types, however, predicted to occur in the Blue Mountains region. Unlike the Hawkesbury soil landscape, soils within the study area are prone to high erodibility and are highly fertile.	N	Moderate	Yes - No habitat presents within the study area
Hygrocybe aurantipes	*Hygrocybe aurantipes*	V	-	Occurs in gallery warm temperate forests dominated by lilly pilly, grey myrtle, cheese tree and sweet pittosporum. Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes	Primarily restricted to Hawkesbury Sandstone vegetation types, however, predicted to occur in the Blue Mountains region. Unlike the Hawkesbury soil landscape, soils	N	Moderate	Yes - No habitat presents within the study area

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	within the study area are prone to high erodibility and are highly fertile.			
Hygrocybe reesiae	*Hygrocybe reesiae*	V	-	Occurs in gallery warm temperate forests dominated by lilly pilly, grey myrtle, cheese tree and sweet pittosporum. Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss.	Primarily restricted to Hawkesbury Sandstone vegetation types, however, predicted to occur in the Blue Mountains region. Unlike the Hawkesbury soil landscape, soils within the study area are prone to high erodibility and are highly fertile.	N	Moderate	Yes - No habitat presents within the study area
Klaphake's Sedge	*Carex klaphakei*	E	-	Found in only three locations, from the Blue Mountains (at Blackheath and Mt Werong) to the Southern Highlands (at Penrose). Grows with other native sedges and rushes in swamps on sandstone at altitudes of greater than 600 metres.	The study area has small areas that support potential habitat for this species.	N	Moderate	Yes -surveyed (Summer, November and December)
Leionema lachnaeoides	*Leionema lachnaeoides*	E	E	Occurs at 10 sites in the upper Blue Mountains, within a 12 km range between Katoomba and Blackheath. Potential habitat	Restricted to escarpment area. No habitat present within the study area.	N	High	Yes - No habitat present within the study area

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				occurs in the Megalong and Jamison Valleys. Populations occur on exposed sandstone cliff tops and terraces, at 960 - 1000m altitude and with aspects from south-east to south-west. Habitat vegetation is montane heath and commonly includes Eucalyptus stricta, Allocasuarina nana, Dillwynia retorta, Epacris microphylla and Caustis flexuosa.				
Megalong Valley Bottlebrush	*Callistemon megalongensis*	CE	CE	Known only from 8 sites within a small section of the eastern Megalong Valley in the western Blue Mountains. This species is primarily restricted to shrub swamps in the immediate vicinity of Nellies Glen Road, with populations extending along the associated downstream watercourses and into the fringing vegetation of Megalong Creek. Riparian populations beyond the shrub swamps are low in density and numbers and are little more than linear outliers of the core swamp-based occurrences.	The species occurs in the lower foothills of the escarpment, south-west of the subject area (Megalong Valley). The habitat requirements outline that the species occurs in the immediate vicinity of Nellies Glen Road, however, the scattered sightings occur approximately 3.5 km away from the subject site, along Megalong Creek.	N	High – occur at lower altitudes in the foothills of the escarpment.	Yes -surveyed (Summer, November, and December)
Mount Vincent Mint-bush	*Prostanthera stricta*	V	V	A locally dominant undershrub in heath or scrub	The study area doesn't support	N	Moderate	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				communities along cliff edges, or as an understorey species within a range of open forest or tall open forest types, or in adjacent transitional communities. Grows in areas of both skeletal soil and on deeper, well-drained soil profiles in areas characterised by steep rocky side slopes, cliff lines, sandstone platforms, or gentle slopes with exposed sandstone outcroppings.	habitat for this species.			
Musty Leek Orchid	*Prasophyllum pallens*	V	-	P. pallens is endemic to New South Wales where it is known only from the Blue Mountains, west of Sydney. The species is presently known from four distinct populations: Mt Banks and Mt Hay in Blue Mountains National Park, and near the townships of Blackheath and Wentworth Falls. Historical records suggest that it once occurred near Leura, Bell and Mount Victoria, although these townships have expanded since the species was collected and it is unclear whether these populations persist. P. pallens grows in dense low heath, often along	The study area supports habitat for this species.	N	Moderate	Yes -surveyed (Summer, November, and December)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				seepage lines, in moist to wet shallow sandy soils over sandstone, mostly at altitudes greater than 900 m above sea level. The fire response of P. pallens is well known with flowering being strongly promoted by fires that occur during the previous summer season.				
Narrow-leaf Finger Fern	*Grammitis stenophylla*	E	-	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	Not present (surveyed) - Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest. No significant rainfall encountered during survey effort. Lack of suitable wet habitats.	N	High	Yes – over 44 person hours of parallel transects completed.
Needle Geebung	*Persoonia acerosa*	V	V	Occurs in dry sclerophyll forest, scrubby low-woodland and heath on low fertility soils. Recorded only on the central coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. Mainly in the Katoomba, Wentworth Falls, Springwood area.	Recorded - Occurs in dry sclerophyll forest, scrubby low-woodland, and heath on low fertility soils. The species is partial to disturbance and has been confirmed as present in the lower portion of the subject site, near Nellies Glen Road. 1 individual recorded in PCT 1248 in the lower portion of the study area.	Y	High	Yes -surveyed (Spring 2020, Winter 2021, Spring 2021 and Winter 2022)
Persoonia hindii	*Persoonia hindii*	E	-	Occurs in dry sclerophyll forests and woodlands on sandy soils. Stoloniferous (has underground horizontal stems) and is thought to be	Not present (surveyed) - The subject site is outside of the known occurrence of the species.	N	High	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				clonal. Hence, each location may comprise only one to a few individuals. Restricted to the Newnes Plateau in the Blue Mountains, north of Lithgow. Was only discovered in 1989 and all known locations occur within Newnes State Forest.				
Pine Donkey Orchid	*Diuris tricolor*	V		Sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the far north of NSW. Localities include the Condobolin-Nymagee road, Wattamondara towards Cowra, Cooyal, Adelong, Red Hill north of Narrandera, Coolamon, near Darlington Point, Eugowra, Girilambone, Dubbo, Muswellbrook, and several sites west of Wagga Wagga. Disturbance regimes are not known, although the species is usually recorded from disturbed habitats.	No habitat present within the study area.	N	Moderate	Yes - No habitat present within the study area
Pultenaea sp. Olinda	*Pultenaea sp. Olinda*	E1		Has been found only in a very limited area of pagoda rock formation east of Rylstone.	The study area does not support potential habitat for this species.	N	High	Yes -surveyed (Spring)
Robertson's Peppermint	*Eucalyptus robertsonii subsp. hemisphaerica*	V	V	Locally frequent in grassy or dry sclerophyll woodland	No habitat present within the study area.,	N	Moderate	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				or forest, on lighter soils and often on granite. Usually found in closed grassy woodlands in locally sheltered sites. Habitats include quartzite ridges, upper slopes and a slight rise of shallow clay over volcanics.				
Rylstone Bell	*Leionema sympetalum*	V	V	Restricted to exposed rocky sandstone formations known as pagodas. The species occurs in dry sclerophyll forest and probably also occurs in open or closed heathland communities.	Restricted to escarpment area. No habitat presents within the study area.	N	High	Yes - No habitat presents within the study area
Scrub Turpentine	*Rhodamnia rubescens*	CE	-	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of R. rubescens typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	The study area doesn't support habitat for this species.	N	High	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
Silky Swainson-pea	*Swainsona sericea*	V		Recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Found in Natural Temperate Grassland and Snow Gum Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines.	The study area doesn't support habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Silver-leafed Gum	*Eucalyptus pulverulenta*	V	V	Found in two quite separate areas, the Lithgow to Bathurst area and the Monaro (Bredbo to Bombala). Grows in shallow soils as an understorey plant in open forest, typically dominated by brittle gum, red stringybark, broad-leaved peppermint, Silvertop ash and apple box.	The study area doesn't support habitat for this species.	N	Low	Yes -surveyed (Spring)
Slaty Leek Orchid	*Prasophyllum fuscum*	CE	V	Tawny Leek-orchid is confined to the Blue Mountains, Hawkesbury sandstone, and the Burrawang district, NSW. This species grows on the margins of swamps at moderate altitudes, about 500–700 m above sea	The subject site supports marginal habitat for this species.	N	Moderate	Yes -surveyed (Summer, November, and December)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				level. Tawny Leek-orchid grows in wet low heathland on gentle slopes, in brown silty loam or in moist heath, often along seepage lines. The species can also be found in grasslands with scattered low Leptospermum and rushes, in silty peat loam, or in boggy soils in open heath, sometimes in running water or at the ecotone between grassy woodland-forest and swamps.				
Small Pale Grass-lily	*Caesia parviflora var. minor*	E	-	This variety occurs uncommonly in Tasmania, southern Victoria and south-east South Australia with an outlying population in NSW, in Barcoongere State Forest, between Grafton and Coffs Harbour. This variety may be more common than currently known, as Pale Grass-lilies are often not identified to variety level. Found in damp places in open forest on sandstone.	The study area has small areas that support potential habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Small Purple-pea	*Swainsona recta*	E1	E	Before European settlement, this species occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's red gum, yellow box,	No habitat present within the study area.,	N	Moderate	Yes - No habitat present within the study area

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				candlebark gum and long-leaf box. Grows in association with understorey dominants that include kangaroo grass, poa tussocks and spear-grasses.				
Small Scurf-pea	*Cullen parvum*	E1		In known populations in Victoria and NSW, plants are found in grassland, river red gum woodland and even grazing country and table drains, in areas with rainfall of between 450- and 700-mm. Plants often occur near watercourses. Plants tend to die back in dry seasons and resprout with rain in winter or spring; in dry years, plants apparently do not always produce shoots but survive below the ground. Flooding has been suggested as a mechanism for seed dispersal.	The study area doesn't support habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Smooth Bush-Pea	*Pultenaea glabra*	V	V	Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone. Restricted to the higher Blue Mountains.	The study area has small areas that support potential habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Superb Midge Orchid	*Genoplesium superbum*	E	-	No habitat present within the study area. The Superb Midge Orchid occurs predominantly in wet	No habitat available within the study area.	N	High	Yes - Parallel traverses (5 m apart) in areas of PCT 967, and the adjacent ecotonal areas, were

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				heathland on shallow soils above a sandstone cap but has also been found in open woodland interspersed with heath and dry open shrubby woodland.				conducted. About 8 person hours of targeted threatened flora searches (by two ecologists) was undertaken within PCT 967 and immediate surrounds.
Thick-leaf Star-hair	*Astrotricha crassifolia*	V	V	The species occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). Occurs in dry sclerophyll woodland on sandstone. Flowers in spring.Resprouter from root suckers or basal stem buds after fire. Seed storage and dispersal ecology and germination requirements are unknown. Not enough data to rank sensitivity to either frequent or infrequent fires.	The species appears to be more prevalent east of the Blue Mountains. It is highly dependent on sandstone geologies. The areas within the subject site are primarily underlain by sandy clay loams, with some earthy and peaty sands.	N	Moderate	Yes – over 52 person hours of parallel transects completed
Velleia perfoliata	*Velleia perfoliata*	V	V	The species is only known from the Hawkesbury District and Upper Hunter Valley in the Central Coast botanical subdivision of NSW. Velleia perfoliata grows in heath on shallow sandy soil over Sandstone. It is currently known to exist in 9 populations. Five of	The study area does not support potential habitat for this species.	N	Moderate	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				these populations are reserved whilst a further population is partly reserved. Four of the reserved sites are situated adjacent to fire trails.				
Velvet Zieria	*Zieria murphyi*	V	V	Velvet Zieria is found in the Blue Mountains at Mt Tomah and in the southern highlands where it has been recorded in Morton National Park in the Bundanoon area, and at Penrose. The Velvet Zieria is found in sheltered positions in moist gullies in moist eucalypt forest with sandy soil.	The study area has small areas that support potential habitat for this species.	N	Moderate	Yes -surveyed (Spring)
Veronica blakelyi	*Veronica blakelyi*	V	-	Survey: Use flowers to identify, as easily confused with Veronica perfoliata. Typically, flowers over summer but will sporadically flower at other times of the year. References: DEC (2006) The Vegetation of the Western Blue Mountains; Species Determination (2000); Garnock-Jones, Albach and Briggs, Taxon Journal (2007);	Not present (surveyed). Restricted to the western Blue Mountains region. Occurs in eucalypt forest, often in moist and sheltered areas. Associated canopy species include Eucalyptus dives, E. dalrympleana, E. rossii and E. pauciflora. These canopy species are more prevalent toward the Lithgow portion of the alignment.	N	High	Yes -surveyed (Spring)
Wollemi Mint-bush	*Prostanthera cryptandroides subsp. cryptandroides*	V	V	At Glen Davis, occurs in open forest dominated by Eucalyptus fibrosa. Other eucalypt species may be present as sub-dominants. In the	The study area does not support potential habitat for this species.	N	Moderate	Yes -surveyed (Spring)

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				Denman-Gungal and Widden-Baerami Valley areas, occurs on rocky ridgelines on Narrabeen Group Sandstones in association with a range of communities.				
Woronora Beard-heath	*Leucopogon exolasius*	V	V	Grows in woodland with Eucalytus piperita, E. sieberi and shrubs Pultenaea flexilis, Leptospermum trinervium, Dillwynia retorta. on sandy alluvium and rocky sandstone hillsides near creeks, low nutrient soils. Restricted to the Woronora and Grose Rivers and Stokes Creek, Royal National Park.	Low - Study area outside of known area of occurrence The species is highly reliant on sandstone geologies. Not known in areas with granitic and basalt influence.	N	High	Study area outside of known area of occurrence
Xanthosia scopulicola	*Xanthosia scopulicola*	V	-	Known only from scattered locations between Kings Tableland (Wentworth Falls) and Boars Head rock (west of Katoomba) in the Blue Mountains. Grows in cracks and crevices of sandstone cliff faces or on rocky outcrops above the cliffs.	Restricted to escarpment area. No habitat presents within the study area.	N	High	Yes -surveyed (Summer, November and December)
Zieria involucrata	*Zieria involucrata*	E	V	Has a disjunct distribution in the Baulkham Hills, Hawkesbury, Hornsby and Blue Mountains LGAs. Recent records for the species come from 22 populations in the catchments of	Restricted to lower elevations. No habitat present within the study area.	N	High	Yes - No habitat present within the study area

Common name	Scientific name	BC Act	EPBC Act	Habitat requirements	Likelihood for occurrence within the study area	Confirmed presence Y/N	Confidence Interval based on survey effort	Satisfied survey requirements
				the Macdonald, Colo and Hawkesbury Rivers. Occurs on Hawkesbury sandstone, Narrabeen Group sandstone and on Quaternary alluvium. Found in sheltered forests on mid- to lower slopes and valleys, in or adjacent to gullies which support sheltered forest, although some populations extend up-slope into drier vegetation.				

Annexure C

Field data sheets

drainage line, 2021-06-17, 10:08

Created	2021-06-17 10:08:07 AEST by Simon Tweed
Updated	2021-06-17 10:09:47 AEST by Simon Tweed
Location	-33.7064319, 150.2943956
Project number	6171
Habitat feature	drainage line
Notes	Cobbles, debris and gravels.no pooling habitat and water discharges rapidly. Not red-crowned toadlet habitat
Photos	 
Date	2021-06-17
Time	10:08

Hollow-bearing tree, 2020-10-29, 10:55

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:55:13 AEDT by Simon Tweed
Updated	2020-10-29 10:55:49 AEDT by Simon Tweed
Location	-33.6665352891744, 150.280372304356
Project number	6299
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Eucalyptus sieberi
Size class(es)	5-10
Height above ground (m)	10
Photos	
Date	2020-10-29
Time	10:55

Hollow-bearing tree, 2020-10-29, 16:19

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 16:19:35 AEDT by Simon Tweed
Updated	2020-10-29 16:20:16 AEDT by Simon Tweed
Location	-33.6687496999532, 150.280047790645
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Size class(es)	5-10
Height above ground (m)	8
Photos	
Date	2020-10-29
Time	16:19

Hollow-bearing stag, 2021-06-17, 10:25

Created	2021-06-17 10:25:25 AEST by Simon Tweed
Updated	2021-06-17 10:33:09 AEST by Simon Tweed
Location	-33.7066468, 150.294255
Project number	6171
Habitat feature	Hollow-bearing stag
Notes	Suitable for microbats - in a gully
Photos	
Date	2021-06-17
Time	10:25

Steep and fenced off - 6m drop, very steep slope (not safe to access), 2021-06-16, 17:06

Created	2021-06-16 17:06:26 AEST by Simon Tweed
Updated	2021-06-16 17:08:54 AEST by Simon Tweed
Location	-33.7062816028382, 150.294870771468
Project number	6171
Habitat feature	Steep and fenced off - 6m drop, very steep slope (not safe to access)
Notes	Trees appear to be less than 30 dbh and no visible hollows from the roadside
Photos	 

Date	2021-06-16
Time	17:06

Hollow-bearing tree, 2020-10-29, 10:55

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:55:52 AEDT by Simon Tweed
Updated	2020-10-29 10:56:40 AEDT by Simon Tweed
Location	-33.6665379333177, 150.280360788766
Project number	6299
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E.sieberi
Size class(es)	0-5, 5-10, 10-15
Height above ground (m)	12,14,16
Photos	
Date	2020-10-29
Time	10:55

2021-06-19, 09:52

Created	2021-06-19 09:52:28 AEST by Simon Tweed
Updated	2021-06-19 09:53:06 AEST by Simon Tweed
Location	-33.7032147310945, 150.290391938813
Project number	6171
Notes	Chewed banksias - Yellow-tailed Cockatoo
Photos	

Date	2021-06-19
Time	09:52

Hollow-bearing tree, 2021-06-18, 10:18

Created	2021-06-18 10:18:20 AEST by Simon Tweed
Updated	2021-06-18 10:20:09 AEST by Simon Tweed
Location	-33.6837877, 150.2861932
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	E. OREADES
Tree number (optional - e.g. if multiple hollows)	1
Size class(es)	10-15
Height above ground (m)	3
Notes	E. Oreades
Photos	
Date	2021-06-18
Time	10:18

Hollow-bearing tree, 2021-06-20, 11:52

Created	2021-06-20 11:52:57 AEST by Simon Tweed
Updated	2021-06-20 11:53:55 AEST by Simon Tweed
Location	-33.6587238830076, 150.27934546751
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	E.sieberi
Tree number (optional - e.g. if multiple hollows)	1
Size class(es)	40-50
Height above ground (m)	5
Notes	Large hollow but too closed to the ground and too exposed for owl
Photos	
Date	2021-06-20
Time	11:52

Hollow-bearing tree, 2019-12-09, 09:39

Created	2019-12-09 09:39:51 AEDT by Simon Tweed
Updated	2020-10-29 13:33:39 AEDT by Simon Tweed
Location	-33.6646098438273, 150.27927774936
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	2
Tree species	E. Sclerophylla
Size class(es)	10-15
Height above ground (m)	10
Photos	
Date	2019-12-09
Time	09:39

Hollow-bearing tree, 2019-12-09, 09:46

Created	2019-12-09 09:46:29 AEDT by Simon Tweed
Updated	2019-12-09 16:17:10 AEDT by Simon Tweed
Location	-33.6636719543328, 150.278451293707
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	2
Tree species	E. Sclerophylla
Size class(es)	10-15, 15-20
Height above ground (m)	7
Photos	
Date	2019-12-09
Time	09:46

Thick leaf litter and shrub layer, 2021-06-19, 09:27

Created	2021-06-19 09:27:53 AEST by Simon Tweed
Updated	2021-06-19 09:28:19 AEST by Simon Tweed
Location	-33.7023930525106, 150.28951451831
Project number	6171
Habitat feature	Thick leaf litter and shrub layer
Photos	
Date	2021-06-19
Time	09:27

Hollow-bearing tree, 2020-10-29, 13:09

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 13:09:28 AEDT by Simon Tweed
Updated	2020-10-29 13:10:01 AEDT by Simon Tweed
Location	-33.6651989146847, 150.279724337161
Project number	6299
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E.seiberi
Size class(es)	0-5
Height above ground (m)	13
Photos	
Date	2020-10-29
Time	13:09

habitat degraded by former development no biodiversity value, 2021-06-18, 08:58

Created	2021-06-18 08:58:14 AEST by Simon Tweed
Updated	2021-06-18 08:59:19 AEST by Simon Tweed
Location	-33.6785412, 150.2824216
Project number	6171
Habitat feature	habitat degraded by former development no biodiversity value
Notes	Degraded paddock, no native vegetation and no habitat
Photos	 

Date	2021-06-18
Time	08:58

Hollow-bearing tree, 2021-06-18, 13:15

Created	2021-06-18 13:15:47 AEST by Simon Tweed
Updated	2021-06-18 13:16:19 AEST by Simon Tweed
Location	-33.6627592, 150.2786901
Project number	6171
Habitat feature	Hollow-bearing tree

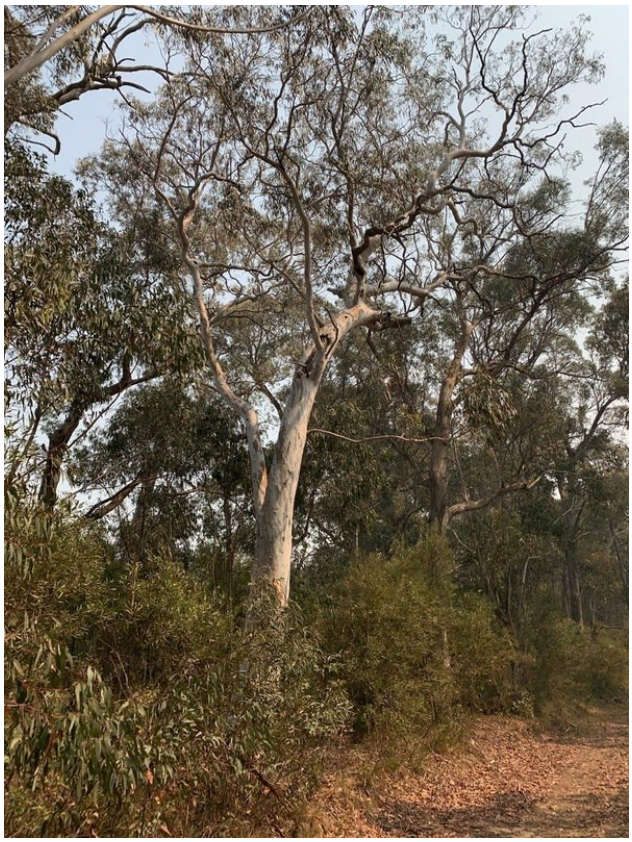
Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Notes	5 m cockatoo sized hollow 10-25 cm
Date	2021-06-18
Time	13:15

Hollow-bearing tree, 2019-12-09, 10:19

Created	2019-12-09 10:19:57 AEDT by Simon Tweed
Updated	2019-12-09 16:17:55 AEDT by Simon Tweed
Location	-33.6603402850292, 150.278597138822
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Tree 5
Size class(es)	5-10
Height above ground (m)	6
Photos	
Date	2019-12-09
Time	10:19

Hollow-bearing tree, 2021-06-20, 10:35

Created	2021-06-20 10:35:41 AEST by Simon Tweed
Updated	2021-06-20 10:36:51 AEST by Simon Tweed
Location	-33.6534350528439, 150.284071042116
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	4
Tree species	E. Piperita
Tree number (optional - e.g. if multiple hollows)	6
Size class(es)	15-20, 10-15
Height above ground (m)	6
Notes	Minimum height of 6 m
Photos	
Date	2021-06-20
Time	10:35

Hollow-bearing tree, 2019-12-09, 11:42

Created	2019-12-09 11:42:17 AEDT by Simon Tweed
Updated	2021-06-17 18:12:54 AEST by Simon Tweed
Location	-33.6529232075505, 150.28410638261
Project number	5029
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Tree 4
Size class(es)	5-10
Height above ground (m)	4
Date	2019-12-09
Time	11:42

notes, 2021-06-17, 10:26

Created	2021-06-17 10:26:35 AEST by Simon Tweed
Updated	2021-06-17 10:32:49 AEST by Simon Tweed
Location	-33.7082967325538, 150.294935144484
Project number	6171
Habitat feature	notes
Notes	Lots of fallen woody debris, moist gully, trees are young age class, on the hill slope it is more shrubby with banksias and hakea (better potential habitat for EPP). No red crowned toddler habitat as less sandstone influence, no talus slopes, no pooling habitat . Potential spotted-tail quoll habitat in the gully area,however, no obvious latrine or den sites were identified. Furthermore, no large hollow bearing trees suitable for forest owls.
Photos	 

Date	2021-06-17
Time	10:26

Hollow-bearing tree, 2019-12-09, 09:15

Created	2019-12-09 09:15:43 AEDT by Simon Tweed
Updated	2019-12-09 16:16:31 AEDT by Simon Tweed
Location	-33.668722372721, 150.279934220016
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Tree sp 1
Size class(es)	10-15
Height above ground (m)	5
Photos	
Date	2019-12-09
Time	09:15

Hollow-bearing tree, 2019-12-09, 11:46

Created	2019-12-09 11:46:04 AEDT by Simon Tweed
Updated	2019-12-09 16:18:31 AEDT by Simon Tweed
Location	-33.6536321849117, 150.282914824784
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E. Sparsifolia?
Size class(es)	15-20
Height above ground (m)	5
Photos	
Date	2019-12-09
Time	11:46

Dense banksia marginata shrub, 2021-06-15, 13:01

Created	2021-06-15 13:01:26 AEST by Simon Tweed
Updated	2021-06-15 13:03:25 AEST by Simon Tweed
Location	-33.6499447250388, 150.288987720907
Project number	6171
Habitat feature	Dense banksia marginata shrub
Notes	Small mammal habitat
Photos	
Date	2021-06-15
Time	13:01

Hollow-bearing tree, 2021-06-20, 11:48

Created	2021-06-20 11:48:08 AEST by Simon Tweed
Updated	2021-06-20 11:49:09 AEST by Simon Tweed
Location	-33.6584122976373, 150.27945404705
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	E.oreades
Tree number (optional - e.g. if multiple hollows)	5
Size class(es)	10-15, 5-10
Height above ground (m)	18
Photos	
Date	2021-06-20
Time	11:48

Other, 2021-06-15, 13:22

Created	2021-06-15 13:22:05 AEST by Simon Tweed
Updated	2021-06-18 13:20:38 AEST by Simon Tweed
Location	-33.6628710706519, 150.287887975574
Project number	6171
Habitat feature	Other
Date	2021-06-15
Time	13:22

2021-06-16, 11:16

Created	2021-06-16 11:16:49 AEST by Simon Tweed
Updated	2021-06-16 11:18:29 AEST by Simon Tweed
Location	-33.650293986762, 150.285442471504
Project number	6171
Notes	Cleared area is degraded/maintained. APZ buffer. No hollow-bearing trees and young ageclass. No feed trees,hydra lines or fallen woody debris.
Photos	 

Date	2021-06-16
Time	11:16

culvert 0.5 m diametre, 2021-06-17, 09:55

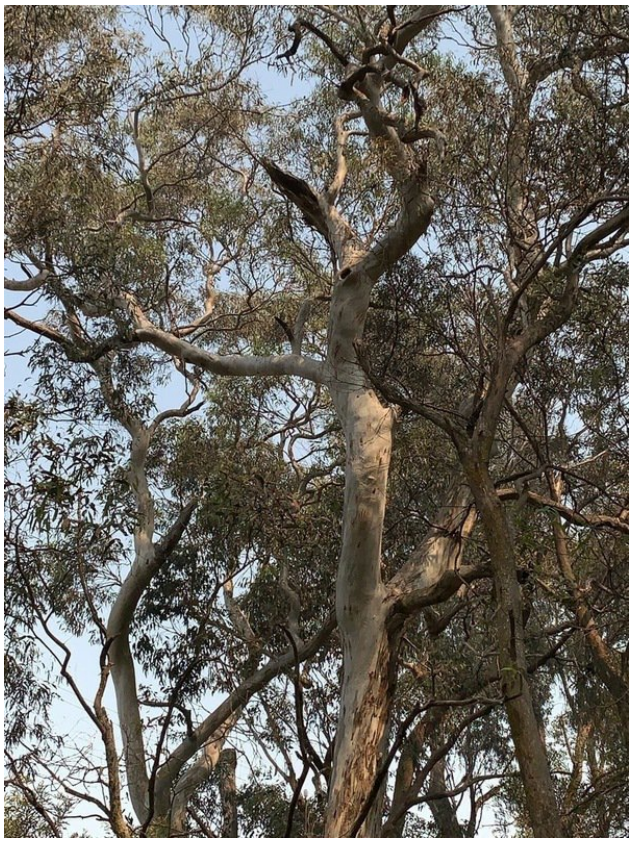
Created	2021-06-17 09:55:33 AEST by Simon Tweed
Updated	2021-06-17 10:05:22 AEST by Simon Tweed
Location	-33.7063104, 150.2944386
Project number	6171
Habitat feature	culvert 0.5 m diametre
Notes	Low clearance but maybe microbat habitat
Photos	 
Date	2021-06-17

Time	09:55

Hollow-bearing tree, 2019-12-09, 09:47

Created	2019-12-09 09:47:16 AEDT by Simon Tweed
Updated	2019-12-09 16:17:19 AEDT by Simon Tweed
Location	-33.6635661934656, 150.27829606086
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E. Sclerophylla
Size class(es)	10-15
Height above ground (m)	7
Photos	
Date	2019-12-09
Time	09:47

Hollow-bearing stag, 2021-06-18, 13:18

Created	2021-06-18 13:18:21 AEST by Simon Tweed
Updated	2021-06-18 13:18:29 AEST by Simon Tweed
Location	-33.6628873, 150.2785368
Project number	6171
Habitat feature	Hollow-bearing stag
Notes	Stag
Date	2021-06-18
Time	13:18

Hollow-bearing tree, 2019-12-09, 11:53

Created	2019-12-09 11:53:40 AEDT by Simon Tweed
Updated	2019-12-09 16:18:20 AEDT by Simon Tweed
Location	-33.6561707989544, 150.280860139553
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Tree 4
Size class(es)	15-20
Height above ground (m)	4
Date	2019-12-09
Time	11:53

2021-06-17, 18:13

Created	2021-06-17 18:13:21 AEST by Simon Tweed
Updated	2021-06-17 18:13:24 AEST by Simon Tweed
Location	-33.6528787, 150.2842295
Project number	5029
Date	2021-06-17
Time	18:13

Hollow-bearing tree, 2019-12-09, 10:07

Created	2019-12-09 10:07:47 AEDT by Simon Tweed
Updated	2019-12-09 16:17:25 AEDT by Simon Tweed
Location	-33.6628459557121, 150.278201512992
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E. Sclerophylla
Size class(es)	5-10
Height above ground (m)	6
Date	2019-12-09
Time	10:07

Chewed banksia cones, 2021-06-19, 09:33

Created	2021-06-19 09:33:41 AEST by Simon Tweed
Updated	2021-06-19 09:33:50 AEST by Simon Tweed
Location	-33.7022425582178, 150.289811744677
Project number	6171
Habitat feature	Chewed banksia cones
Date	2021-06-19
Time	09:33

notes, 2021-06-17, 10:33

Created	2021-06-17 10:33:11 AEST by Simon Tweed
Updated	2021-06-17 10:36:54 AEST by Simon Tweed
Location	-33.7066315, 150.2940724
Project number	6171
Habitat feature	notes
Notes	Moist gully, young age class, no large hollowbesring trees for forest owls, no red crowned toddler habitat as the drainage line lacks talus slopes, pooling habitat and sandstone influence, EPP potential habitat on the hillslope to the east more habeas and banksias, likely a flyaway for threatened bats given that there is escarpment close by, a gully and a flyaway. Potential spotted quoll habitat but no latrine or den sites observed
Photos	 

Date	2021-06-17
Time	10:33

Hollow-bearing tree, 2020-10-29, 16:16

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 16:16:41 AEDT by Simon Tweed
Updated	2020-10-29 16:17:48 AEDT by Simon Tweed
Location	-33.6689162610755, 150.280245616897
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E.radiata
Size class(es)	0-5
Height above ground (m)	16
Photos	
Date	2020-10-29
Time	16:16

Hollow-bearing tree, 2020-10-29, 16:18

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 16:18:43 AEDT by Simon Tweed
Updated	2020-10-29 16:20:28 AEDT by Simon Tweed
Location	-33.6687953708945, 150.280070707889
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	2
Tree species	E.oreades
Size class(es)	5-10, 0-5
Height above ground (m)	18,15
Photos	
Date	2020-10-29
Time	16:18

Hollow-bearing tree, 2020-10-29, 16:11

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 16:11:41 AEDT by Simon Tweed
Updated	2020-10-29 16:12:42 AEDT by Simon Tweed
Location	-33.6687967346728, 150.280190852974
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Size class(es)	0-5, 5-10
Height above ground (m)	15
Photos	
Date	2020-10-29
Time	16:11

Young ageclass - PCT 1248 no hollows, 2021-06-15, 13:38

Created	2021-06-15 13:38:36 AEST by Simon Tweed
Updated	2021-06-15 13:39:40 AEST by Simon Tweed
Location	-33.6613341549731, 150.283113732023
Project number	6171
Habitat feature	Young ageclass - PCT 1248 no hollows
Photos	 

Date	2021-06-15
Time	13:38

Hollow-bearing tree, 2021-06-20, 11:02

Created	2021-06-20 11:02:10 AEST by Simon Tweed
Updated	2021-06-20 11:02:43 AEST by Simon Tweed
Location	-33.6550053740261, 150.282238165197
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Sieberi
Tree number (optional - e.g. if multiple hollows)	2
Size class(es)	10-15
Height above ground (m)	10
Photos	
Date	2021-06-20
Time	11:02

Hollow-bearing tree, 2020-10-29, 16:13

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 16:13:50 AEDT by Simon Tweed
Updated	2020-10-29 16:14:53 AEDT by Simon Tweed
Location	-33.6687863593109, 150.280290899416
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Eucalyptus radiata?
Size class(es)	0-5
Height above ground (m)	20
Photos	
Date	2020-10-29
Time	16:13

Hollow-bearing tree, 2021-06-18, 09:46

Created	2021-06-18 09:46:03 AEST by Simon Tweed
Updated	2021-06-18 09:47:09 AEST by Simon Tweed
Location	-33.683066, 150.2855696
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Eucalyptus oreades
Tree number (optional - e.g. if multiple hollows)	1
Size class(es)	5-10
Height above ground (m)	3
Notes	Spout hollow
Photos	
Date	2021-06-18
Time	09:46

Bandicoot diggings, 2021-06-16, 11:39

Created	2021-06-16 11:39:37 AEST by Simon Tweed
Updated	2021-06-16 11:40:18 AEST by Simon Tweed
Location	-33.650894877566, 150.286974683404
Project number	6171
Habitat feature	Bandicoot diggings
Notes	Bandicoot diggings
Photos	
Date	2021-06-16
Time	11:39

Hollow-bearing tree, 2019-12-09, 09:45

Created	2019-12-09 09:45:05 AEDT by Simon Tweed
Updated	2019-12-09 16:17:02 AEDT by Simon Tweed
Location	-33.6637690644604, 150.278533101082
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	2
Tree species	E. Sclerophylla
Size class(es)	5-10
Height above ground (m)	7
Date	2019-12-09
Time	09:45

Hollow-bearing tree, 2021-06-18, 13:21

Created	2021-06-18 13:21:31 AEST by Simon Tweed
Updated	2021-06-18 13:22:02 AEST by Simon Tweed
Location	-33.6632444, 150.2784431
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	2
Tree species	Eucalyptus spp
Tree number (optional - e.g. if multiple hollows)	2
Size class(es)	0-5, 5-10
Height above ground (m)	6
Date	2021-06-18
Time	13:21

Hollow-bearing tree, 2019-12-09, 11:54

Created	2019-12-09 11:54:41 AEDT by Simon Tweed
Updated	2021-06-20 12:21:50 AEST by Simon Tweed
Location	-33.6564233641451, 150.280734238409
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	E. Sieberi
Size class(es)	5-10
Height above ground (m)	7
Date	2019-12-09
Time	11:54

Hollow-bearing tree, 2019-12-09, 12:15

Created	2019-12-09 12:15:56 AEDT by Simon Tweed
Updated	2019-12-09 12:16:31 AEDT by Simon Tweed
Location	-33.6673285772807, 150.280486755073
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E. Sieberi
Size class(es)	15-20
Height above ground (m)	6
Photos	
Date	2019-12-09
Time	12:15

fallen woody debris, 2021-06-18, 12:37

Created	2021-06-18 12:37:41 AEST by Simon Tweed
Updated	2021-06-18 12:38:08 AEST by Simon Tweed
Location	-33.6688122, 150.2805789
Project number	6171
Habitat feature	fallen woody debris
Notes	Hollowed out logs
Photos	
Date	2021-06-18
Time	12:37

Resting area - Eastern Grey Kangaroo, 2021-06-15, 13:40

Created	2021-06-15 13:40:25 AEST by Simon Tweed
Updated	2021-06-15 13:41:00 AEST by Simon Tweed
Location	-33.6550532730311, 150.288067348301
Project number	6171
Habitat feature	Resting area - Eastern Grey Kangaroo
Photos	
Date	2021-06-15
Time	13:40

2021-06-19, 09:37

Created	2021-06-19 09:37:06 AEST by Simon Tweed
Updated	2021-06-19 09:37:25 AEST by Simon Tweed
Location	-33.7021030836634, 150.290015902823
Project number	6171
Notes	Lyrebird scratchings
Photos	
Date	2021-06-19
Time	09:37

Hollow-bearing tree, 2019-12-09, 10:09

Created	2019-12-09 10:09:30 AEDT by Simon Tweed
Updated	2019-12-09 16:17:32 AEDT by Simon Tweed
Location	-33.6625035546344, 150.278225317597
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Eucalyptus
Size class(es)	10-15
Height above ground (m)	4
Photos	
Date	2019-12-09
Time	10:09

Hollow-bearing tree, 2021-06-18, 13:25

Created	2021-06-18 13:25:20 AEST by Simon Tweed
Updated	2021-06-18 13:25:40 AEST by Simon Tweed
Location	-33.6628869, 150.2786882
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Eucalyptus spp
Tree number (optional - e.g. if multiple hollows)	1
Size class(es)	5-10
Height above ground (m)	6
Date	2021-06-18
Time	13:25

Hollow-bearing tree, 2019-12-09, 10:47

Created	2019-12-09 10:47:50 AEDT by Simon Tweed
Updated	2019-12-09 16:18:11 AEDT by Simon Tweed
Location	-33.6565602929238, 150.280730836093
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Tree 4
Size class(es)	20-30
Height above ground (m)	5
Photos	
Date	2019-12-09
Time	10:47

Hollow-bearing tree, 2021-06-20, 11:01

Created	2021-06-20 11:01:01 AEST by Simon Tweed
Updated	2021-06-20 11:01:30 AEST by Simon Tweed
Location	-33.6549526209294, 150.2821975006
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Sieberi
Tree number (optional - e.g. if multiple hollows)	2
Size class(es)	5-10
Height above ground (m)	8
Date	2021-06-20
Time	11:01

Hollow-bearing tree, 2021-06-18, 13:27

Created	2021-06-18 13:27:03 AEST by Simon Tweed
Updated	2021-06-18 13:27:33 AEST by Simon Tweed
Location	-33.6628301, 150.2788473
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Eucalyptus spp.
Tree number (optional - e.g. if multiple hollows)	1
Size class(es)	5-10
Height above ground (m)	5
Date	2021-06-18
Time	13:27

Hollow-bearing tree, 2019-12-09, 11:50

Created	2019-12-09 11:50:10 AEDT by Simon Tweed
Updated	2019-12-09 16:18:26 AEDT by Simon Tweed
Location	-33.6550426301719, 150.281674769155
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	E. Piperita?
Size class(es)	15-20
Height above ground (m)	6
Photos	
Date	2019-12-09
Time	11:50

Fallen timber, 2021-06-15, 13:37

Created	2021-06-15 13:37:28 AEST by Simon Tweed
Updated	2021-06-15 13:38:19 AEST by Simon Tweed
Location	-33.6551551372443, 150.28840765357
Project number	6171
Habitat feature	Fallen timber
Notes	Fallen woody debris refugia in open area
Photos	
Date	2021-06-15
Time	13:37

degraded habitat, 2021-06-18, 10:28

Created	2021-06-18 10:28:09 AEST by Simon Tweed
Updated	2021-06-18 10:30:37 AEST by Simon Tweed
Location	-33.6850292, 150.2872554
Project number	6171
Habitat feature	degraded habitat
Notes	Low condition veg, some exotic, no hollows and adjacent to busy road ave decibels of 70db.
Photos	 

Date	2021-06-18
Time	10:28

good epp habitst, 2021-06-18, 09:47

Created	2021-06-18 09:47:35 AEST by Simon Tweed
Updated	2021-06-18 09:47:59 AEST by Simon Tweed
Location	-33.6828906, 150.2856726
Project number	6171
Habitat feature	good epp habitst
Photos	
Date	2021-06-18
Time	09:47

Hollow-bearing tree, 2019-12-09, 11:43

Created	2019-12-09 11:43:37 AEDT by Simon Tweed
Updated	2019-12-09 11:44:02 AEDT by Simon Tweed
Location	-33.6532432683394, 150.283778766131
Project number	5029
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Eucalyptus sieberi
Size class(es)	5-10
Height above ground (m)	5
Date	2019-12-09
Time	11:43

Hollow-bearing tree, 2019-12-09, 10:14

Created	2019-12-09 10:14:33 AEDT by Simon Tweed
Updated	2019-12-09 16:17:44 AEDT by Simon Tweed
Location	-33.6616515923312, 150.278524383903
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Eucalyptus sieberi
Size class(es)	10-15
Height above ground (m)	6
Date	2019-12-09
Time	10:14

2020-10-28, 10:45

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 10:45:15 AEDT by Simon Tweed
Updated	2020-10-28 10:48:41 AEDT by Simon Tweed
Location	-33.6778753302264, 150.282340328142
Project number	6229
Date	2020-10-28
Time	10:45

Hollow-bearing tree, 2019-12-09, 09:35

Created	2019-12-09 09:35:18 AEDT by Simon Tweed
Updated	2019-12-09 16:16:45 AEDT by Simon Tweed
Location	-33.6657268705475, 150.280135385692
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Eucalyptus seiberi
Size class(es)	15-20
Height above ground (m)	3
Date	2019-12-09
Time	09:35

Patch of planted veg - caliterus spp. No fauna value, 2021-06-15, 15:23

Created	2021-06-15 15:23:34 AEST by Simon Tweed
Updated	2021-06-15 15:26:22 AEST by Simon Tweed
Location	-33.7001667544648, 150.320732966065
Project number	6171
Habitat feature	Patch of planted veg - caliterus spp. No fauna value
Notes	One pittosporum undulatum (young), all caliterus spp. Not fauna value ...only pittosporum for opportunistic foraging
Photos	 

Date	2021-06-15
Time	15:23

Fallen timber, 2020-10-28, 15:43

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 15:43:30 AEDT by Simon Tweed
Updated	2020-10-28 15:45:11 AEDT by Simon Tweed
Location	-33.6855584793086, 150.288062324306
Project number	6229
Habitat feature	Fallen timber
Notes	Fallen woody debris with hollows

Photos

Date	2020-10-28
Time	15:43

Hollow-bearing tree, 2019-12-09, 11:44

Created	2019-12-09 11:44:11 AEDT by Simon Tweed
Updated	2019-12-09 11:44:40 AEDT by Simon Tweed
Location	-33.6533045387212, 150.283874049783
Project number	5577
Habitat feature	Hollow-bearing tree

Tree hollow details

Number of hollows	1
Tree species	Eucalyptus sieberi
Size class(es)	10-15
Height above ground (m)	4
Date	2019-12-09
Time	11:44

Hollow-bearing stag, 2021-06-15, 13:22

Created	2021-06-15 13:22:46 AEST by Simon Tweed
Updated	2021-06-15 13:23:33 AEST by Simon Tweed
Location	-33.65919876, 150.28305053
Project number	6171
Habitat feature	Hollow-bearing stag
Notes	Microbat suitable
Photos	
Date	2021-06-15
Time	13:22

Ponded area, 2021-06-20, 11:26

Created	2021-06-20 11:26:26 AEST by Simon Tweed
Updated	2021-06-20 11:28:39 AEST by Simon Tweed
Location	-33.6571520183038, 150.280511660273
Project number	6171
Habitat feature	Ponded area
Notes	Small waterbody - lots of fringing veg (gahnia, Baumea , acacia and lepto), stagnant, no tadpoles, signs of iron flocculant and likely receiving nutrient inputs from runoff from the road.
Photos	

Date	2021-06-20
Time	11:26

Hollow-bearing tree, 2021-06-18, 13:17

Created	2021-06-18 13:17:01 AEST by Simon Tweed
Updated	2021-06-18 13:18:01 AEST by Simon Tweed
Location	-33.6629101, 150.2786423
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Eucalyptus spp.
Tree number (optional - e.g. if multiple hollows)	5
Size class(es)	0-5, 5-10
Height above ground (m)	5
Notes	On track multiple small to medium sized hollows
Photos	
Date	2021-06-18
Time	13:17

Diggings- long-nosed bandicoot, 2021-06-19, 09:31

Created	2021-06-19 09:31:25 AEST by Simon Tweed
Updated	2021-06-19 09:31:47 AEST by Simon Tweed
Location	-33.7023151413578, 150.289815817271
Project number	6171
Habitat feature	Diggings- long-nosed bandicoot
Date	2021-06-19
Time	09:31

Hollow-bearing tree, 2021-06-20, 11:03

Created	2021-06-20 11:03:31 AEST by Simon Tweed
Updated	2021-06-20 11:04:17 AEST by Simon Tweed
Location	-33.6550624480566, 150.282226424086
Project number	6171
Habitat feature	Hollow-bearing tree

Tree hollow details

Detailed hollow record required	No
Number of hollows	1
Tree species	Sieberi
Tree number (optional - e.g. if multiple hollows)	3
Size class(es)	10-15
Height above ground (m)	12
Notes	Marginal cockatoo hollows
Photos	
Date	2021-06-20
Time	11:03

6229, TFNSW - MB2BH NPWS land hbt10

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:17:28 AEDT by Simon Tweed
Updated	2020-10-29 10:18:03 AEDT by Simon Tweed
Location	-33.6672855851269, 150.280440135515
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt10
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, 14

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 13:13:38 AEDT by Simon Tweed
Updated	2020-10-29 13:14:36 AEDT by Simon Tweed
Location	-33.6649154032153, 150.27998231502
Project number	6229
Plot reference	14
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:28:58 AEST by Simon Tweed
Updated	2021-06-19 10:29:22 AEST by Simon Tweed
Location	-33.7005849319468, 150.289907070229
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus piperita
DBH	50
Hollows < 5cm	3
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:08:50 AEST by Simon Tweed
Updated	2021-06-20 10:09:32 AEST by Simon Tweed
Location	-33.6519079752702, 150.28518573265
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	5
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt7

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:07:10 AEDT by Simon Tweed
Updated	2020-10-29 10:07:56 AEDT by Simon Tweed
Location	-33.6675966971144, 150.280309470232
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt7
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:39:49 AEST by Simon Tweed
Updated	2021-06-20 10:40:22 AEST by Simon Tweed
Location	-33.6534850416228, 150.283579454765
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:56:47 AEST by Simon Tweed
Updated	2021-06-20 11:57:16 AEST by Simon Tweed
Location	-33.6589195931856, 150.27923932369
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	45
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:13:33 AEST by Sarah Hart
Updated	2021-06-20 12:14:07 AEST by Sarah Hart
Location	-33.6602749643843, 150.278496600614
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus mannifera subsp. gullickii
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:57:39 AEST by Simon Tweed
Updated	2021-06-19 09:58:31 AEST by Simon Tweed
Location	-33.7035693523024, 150.290567840192
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus piperita
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	2
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-18 13:14:52 AEST by Simon Tweed
Updated	2021-06-18 13:15:42 AEST by Simon Tweed
Location	-33.6627377, 150.2786953
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	2
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:11:30 AEST by Simon Tweed
Updated	2021-06-20 11:12:00 AEST by Simon Tweed
Location	-33.6557979197955, 150.281417139187
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	3
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP8 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:53:45 AEDT by Simon Tweed
Updated	2020-10-28 16:54:58 AEDT by Simon Tweed
Location	-33.6857053297335, 150.288042537868
Project number	6229
Plot reference	RDP8 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	150
Hollows < 5cm	2
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:10:06 AEST by Sarah Hart
Updated	2021-06-20 11:10:37 AEST by Sarah Hart
Location	-33.6557965275897, 150.281383998726
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	20
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:07:05 AEST by Simon Tweed
Updated	2021-06-20 10:07:45 AEST by Simon Tweed
Location	-33.6522024751441, 150.28503472079
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	60
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:51:26 AEST by Simon Tweed
Updated	2021-06-19 09:51:59 AEST by Simon Tweed
Location	-33.7031285381125, 150.290457239335
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus viminalis
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:16:33 AEST by Simon Tweed
Updated	2021-06-20 12:17:05 AEST by Simon Tweed
Location	-33.6625307086217, 150.278805297357
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:11:40 AEST by Sarah Hart
Updated	2021-06-20 11:12:09 AEST by Sarah Hart
Location	-33.6559087583961, 150.281273618445
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6171, SH03

Created	2021-06-16 09:43:58 AEST by Simon Tweed
Updated	2021-06-16 09:44:59 AEST by Simon Tweed
Location	-33.6861317225728, 150.287948092208
Project number	6171
Plot reference	SH03
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	110
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:53:50 AEST by Simon Tweed
Updated	2021-06-19 09:54:28 AEST by Simon Tweed
Location	-33.7033044236422, 150.290410928428
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	2
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 6171SH13

Created	2021-06-19 12:15:14 AEST by Simon Tweed
Updated	2021-06-19 12:15:54 AEST by Simon Tweed
Location	-33.6540374072695, 150.284095596983
Project number	6171
Plot reference	6171SH13
PCT	000
Type	Stag
Species	Eucalyptus spp.
DBH	35
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:49:55 AEST by Simon Tweed
Updated	2021-06-20 11:50:23 AEST by Simon Tweed
Location	-33.6584925904179, 150.279475217779
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 11:10:38 AEST by Simon Tweed
Updated	2021-06-19 11:11:16 AEST by Simon Tweed
Location	-33.6565310552303, 150.280684336402
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	120
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, -

Created	2021-06-20 10:31:58 AEST by Sarah Hart
Updated	2021-06-20 10:34:43 AEST by Sarah Hart
Location	-33.6535875313306, 150.282937958837
Project number	6171
Plot reference	-
PCT	1248
Type	Tree
Species	Eucalyptus sparsifolia
DBH	20
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

5144, TFNSW - MB2BH NPWS land hbt5

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:03:55 AEDT by Simon Tweed
Updated	2020-10-29 10:04:25 AEDT by Simon Tweed
Location	-33.668029095191, 150.280197267537
Project number	5144
Plot reference	TFNSW - MB2BH NPWS land hbt5
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	2
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:59:15 AEST by Simon Tweed
Updated	2021-06-19 09:59:53 AEST by Simon Tweed
Location	-33.7034845808705, 150.290538102874
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus piperita
DBH	40
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP8 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:29:24 AEDT by Simon Tweed
Updated	2020-10-28 16:34:24 AEDT by Simon Tweed
Location	-33.6864612948062, 150.288365484874
Project number	6229
Plot reference	RDP8 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:16:25 AEST by Simon Tweed
Updated	2021-06-20 10:16:47 AEST by Simon Tweed
Location	-33.6520758704508, 150.285912538882
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 11:38:44 AEST by Simon Tweed
Updated	2021-06-19 11:39:36 AEST by Simon Tweed
Location	-33.6541682006916, 150.283599158492
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	90
Hollows < 5cm	3
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:08:22 AEST by Simon Tweed
Updated	2021-06-20 12:08:49 AEST by Simon Tweed
Location	-33.6613295578714, 150.279097370803
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:02:56 AEST by Simon Tweed
Updated	2021-06-20 12:03:29 AEST by Simon Tweed
Location	-33.6600462867799, 150.278854060259
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus spp.
DBH	90
Hollows < 5cm	3
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:26:55 AEST by Sarah Hart
Updated	2021-06-20 11:28:35 AEST by Sarah Hart
Location	-33.6570763016327, 150.280454233289
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	70
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:46:12 AEST by Simon Tweed
Updated	2021-06-20 10:46:54 AEST by Simon Tweed
Location	-33.6539601089387, 150.283044576645
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	3
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:10:17 AEST by Simon Tweed
Updated	2021-06-20 11:10:44 AEST by Simon Tweed
Location	-33.6556990621944, 150.28173096478
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:28:46 AEST by Simon Tweed
Updated	2021-06-20 11:29:11 AEST by Simon Tweed
Location	-33.6571760101391, 150.280534012112
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:59:35 AEST by Simon Tweed
Updated	2021-06-20 11:00:13 AEST by Simon Tweed
Location	-33.6548263805281, 150.282206386328
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP7 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:03:11 AEDT by Simon Tweed
Updated	2020-10-28 16:05:46 AEDT by Simon Tweed
Location	-33.6856520961217, 150.288550525945
Project number	6229
Plot reference	RDP7 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt11

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:53:45 AEDT by Simon Tweed
Updated	2020-10-29 10:55:34 AEDT by Simon Tweed
Location	-33.6664637947637, 150.280333418478
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt11
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	2
Hollows 21-30cm	1
Hollows > 30cm	1

6171, 0

Created	2021-06-20 11:59:31 AEST by Simon Tweed
Updated	2021-06-20 11:59:53 AEST by Simon Tweed
Location	-33.6593569189586, 150.279043725606
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	40
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:19:18 AEST by Simon Tweed
Updated	2021-06-20 11:19:44 AEST by Simon Tweed
Location	-33.6567383197729, 150.280727100211
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:26:58 AEST by Simon Tweed
Updated	2021-06-19 10:28:14 AEST by Simon Tweed
Location	-33.7005031680622, 150.289875834133
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus piperita
DBH	45
Hollows < 5cm	2
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:30:32 AEST by Simon Tweed
Updated	2021-06-20 10:31:14 AEST by Simon Tweed
Location	-33.6532473260983, 150.284325666726
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	100
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:18:20 AEST by Sarah Hart
Updated	2021-06-20 11:19:31 AEST by Sarah Hart
Location	-33.6568859731992, 150.280280560255
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	40
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:32:43 AEST by Simon Tweed
Updated	2021-06-20 10:33:04 AEST by Simon Tweed
Location	-33.653200449588, 150.284107399561
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:14:59 AEST by Simon Tweed
Updated	2021-06-20 12:15:26 AEST by Simon Tweed
Location	-33.6622603274739, 150.27883141605
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus oreades
DBH	60
Hollows < 5cm	3
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 12:23:17 AEDT by Simon Tweed
Updated	2020-11-26 12:24:10 AEDT by Simon Tweed
Location	-33.6988264670321, 150.290827676654
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Stag
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	3
Hollows 5-10cm	2
Hollows 11-20cm	2
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:30:34 AEST by Sarah Hart
Updated	2021-06-20 11:31:06 AEST by Sarah Hart
Location	-33.6569752294472, 150.280172362873
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6229, Hbt13

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 13:05:35 AEDT by Simon Tweed
Updated	2020-10-29 13:07:12 AEDT by Simon Tweed
Location	-33.665265352909, 150.28029027719
Project number	6229
Plot reference	Hbt13
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-17 18:14:37 AEST by Simon Tweed
Updated	2021-06-17 18:15:21 AEST by Simon Tweed
Location	-33.6530087, 150.2842653
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	120
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:14:34 AEST by Sarah Hart
Updated	2021-06-20 12:15:03 AEST by Sarah Hart
Location	-33.6604617550734, 150.278565336645
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	40
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:21:36 AEST by Simon Tweed
Updated	2021-06-19 10:22:12 AEST by Simon Tweed
Location	-33.7007196416687, 150.28949937433
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus spp.
DBH	35
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:28:31 AEST by Simon Tweed
Updated	2021-06-20 10:29:10 AEST by Simon Tweed
Location	-33.6531593216304, 150.284458458137
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	3
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 10:15:54 AEST by Simon Tweed
Updated	2021-06-19 10:18:18 AEST by Simon Tweed
Location	-33.7011363276385, 150.289641000481
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus piperita
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:47:39 AEST by Simon Tweed
Updated	2021-06-20 10:48:34 AEST by Simon Tweed
Location	-33.6539896680241, 150.283099588334
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:56:52 AEST by Sarah Hart
Updated	2021-06-20 11:57:20 AEST by Sarah Hart
Location	-33.6587744850537, 150.278897668128
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:37:33 AEST by Simon Tweed
Updated	2021-06-20 10:38:00 AEST by Simon Tweed
Location	-33.6534246394549, 150.28398739541
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus oreades
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:18:39 AEST by Simon Tweed
Updated	2021-06-20 11:19:04 AEST by Simon Tweed
Location	-33.6566593677635, 150.280831201135
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:15:35 AEST by Simon Tweed
Updated	2021-06-20 12:16:06 AEST by Simon Tweed
Location	-33.6623089273991, 150.27881311917
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus oreades
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP8 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:33:05 AEDT by Simon Tweed
Updated	2020-10-28 16:34:31 AEDT by Simon Tweed
Location	-33.686417285681, 150.288480743766
Project number	6229
Plot reference	RDP8 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	200
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	1

6171, 0

Created	2021-06-20 11:37:57 AEST by Simon Tweed
Updated	2021-06-20 11:38:32 AEST by Simon Tweed
Location	-33.6576612379957, 150.279992558062
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	50
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:45:45 AEST by Sarah Hart
Updated	2021-06-20 11:46:11 AEST by Sarah Hart
Location	-33.6583542985527, 150.279398726889
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	50
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:56:06 AEST by Simon Tweed
Updated	2021-06-19 09:57:07 AEST by Simon Tweed
Location	-33.7035021461441, 150.290507974835
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus oreades
DBH	150
Hollows < 5cm	0
Hollows 5-10cm	4
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:51:41 AEST by Simon Tweed
Updated	2021-06-20 11:52:15 AEST by Simon Tweed
Location	-33.658799843177, 150.279737077653
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:04:12 AEST by Simon Tweed
Updated	2021-06-20 10:04:35 AEST by Simon Tweed
Location	-33.6524178457887, 150.285037815282
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus viminalis
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:29:37 AEST by Simon Tweed
Updated	2021-06-20 10:30:15 AEST by Simon Tweed
Location	-33.6532258364691, 150.284399427474
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	3
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:33:20 AEST by Sarah Hart
Updated	2021-06-20 11:33:49 AEST by Sarah Hart
Location	-33.6570440387221, 150.280076150968
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	40
Hollows < 5cm	2
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:08:38 AEST by Sarah Hart
Updated	2021-06-20 11:09:16 AEST by Sarah Hart
Location	-33.6556818955502, 150.281465401963
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	20
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:22:53 AEST by Simon Tweed
Updated	2021-06-19 10:23:19 AEST by Simon Tweed
Location	-33.7006709215947, 150.289516903479
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	45
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:15:18 AEST by Sarah Hart
Updated	2021-06-20 12:17:03 AEST by Sarah Hart
Location	-33.6605540470637, 150.278579369187
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	40
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 12:20:20 AEDT by Simon Tweed
Updated	2020-11-26 12:20:51 AEDT by Simon Tweed
Location	-33.6985854, 150.2907645
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Stag
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:35:08 AEST by Simon Tweed
Updated	2021-06-19 09:35:41 AEST by Simon Tweed
Location	-33.7021845903488, 150.289940193674
Project number	6171
Plot reference	000
PCT	000
Type	Stag
Species	Eucalyptus spp.
DBH	90
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:42:12 AEST by Sarah Hart
Updated	2021-06-20 11:42:48 AEST by Sarah Hart
Location	-33.6579478441992, 150.279379338026
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 11:07:11 AEST by Simon Tweed
Updated	2021-06-19 11:07:51 AEST by Simon Tweed
Location	-33.6561690505604, 150.280870824936
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	120
Hollows < 5cm	1
Hollows 5-10cm	3
Hollows 11-20cm	0
Hollows 21-30cm	8
Hollows > 30cm	0

6229, RDP7 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 15:11:04 AEDT by Simon Tweed
Updated	2020-10-28 15:31:04 AEDT by Simon Tweed
Location	-33.6852589751682, 150.287833996604
Project number	6229
Plot reference	RDP7 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP8 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:57:53 AEDT by Simon Tweed
Updated	2020-10-28 16:58:33 AEDT by Simon Tweed
Location	-33.6856145697665, 150.287879255444
Project number	6229
Plot reference	RDP8 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	250
Hollows < 5cm	2
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP7 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 15:29:38 AEDT by Simon Tweed
Updated	2020-10-28 15:30:48 AEDT by Simon Tweed
Location	-33.6853628366867, 150.288239982447
Project number	6229
Plot reference	RDP7 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	150
Hollows < 5cm	5
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:12:32 AEST by Simon Tweed
Updated	2021-06-20 11:13:02 AEST by Simon Tweed
Location	-33.6560518794509, 150.281199876703
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 10:44:35 AEDT by Simon Tweed
Updated	2020-11-26 10:45:37 AEDT by Simon Tweed
Location	-33.6977508747316, 150.289159342647
Project number	6229
Plot reference	Hbt
PCT	Bm swamp
Type	Tree
Species	Eucalyptus oreades
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:31:25 AEST by Sarah Hart
Updated	2021-06-20 11:31:57 AEST by Sarah Hart
Location	-33.6570392661776, 150.280202397029
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	70
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	2
Hollows 21-30cm	0
Hollows > 30cm	0

5144, RDP7 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:05:58 AEDT by Simon Tweed
Updated	2021-06-16 09:36:13 AEST by Simon Tweed
Location	-33.6857569411584, 150.288459286094
Project number	5144
Plot reference	RDP7 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 11:27:23 AEST by Simon Tweed
Updated	2021-06-19 11:28:03 AEST by Simon Tweed
Location	-33.6539712379492, 150.283698846125
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	45
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:17:18 AEST by Simon Tweed
Updated	2021-06-20 12:17:40 AEST by Simon Tweed
Location	-33.6626311793367, 150.278763777937
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	30
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:50:40 AEST by Simon Tweed
Updated	2021-06-20 10:51:01 AEST by Simon Tweed
Location	-33.6540990893292, 150.28314625997
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	5
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:46:18 AEST by Simon Tweed
Updated	2021-06-19 09:47:01 AEST by Simon Tweed
Location	-33.7029228552735, 150.290253013372
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	3
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:38:51 AEST by Simon Tweed
Updated	2021-06-20 10:39:27 AEST by Simon Tweed
Location	-33.6535265572821, 150.283837995834
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-17 12:15:10 AEST by Simon Tweed
Updated	2021-06-19 10:41:00 AEST by Simon Tweed
Location	-33.7008978, 150.2898069
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	110
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:15:06 AEST by Sarah Hart
Updated	2021-06-20 11:15:51 AEST by Sarah Hart
Location	-33.6562206575961, 150.280622877181
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 10:07:29 AEST by Simon Tweed
Updated	2021-06-19 10:08:06 AEST by Simon Tweed
Location	-33.7014445364112, 150.290017328479
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus piperita
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-19 11:23:58 AEST by Simon Tweed
Updated	2021-06-19 11:24:38 AEST by Simon Tweed
Location	-33.6537053086061, 150.283720126572
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	30
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 11:09:38 AEST by Simon Tweed
Updated	2021-06-19 11:10:14 AEST by Simon Tweed
Location	-33.6564093254934, 150.280735855953
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:46:47 AEST by Sarah Hart
Updated	2021-06-20 11:47:15 AEST by Sarah Hart
Location	-33.6582866355008, 150.279460139573
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	45
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:31:25 AEST by Simon Tweed
Updated	2021-06-20 10:31:57 AEST by Simon Tweed
Location	-33.6532043468346, 150.284482575953
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-18 12:42:58 AEST by Simon Tweed
Updated	2021-06-18 12:43:47 AEST by Simon Tweed
Location	-33.6690658651855, 150.280146114528
Project number	6171
Plot reference	000
PCT	926
Type	Tree
Species	Eucalyptus spp.
DBH	200
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:17:55 AEST by Simon Tweed
Updated	2021-06-20 12:18:26 AEST by Simon Tweed
Location	-33.6627140817897, 150.278680788449
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	3
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:49:32 AEST by Simon Tweed
Updated	2021-06-19 09:50:27 AEST by Simon Tweed
Location	-33.7030731122557, 150.290372817617
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus spp.
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:24:38 AEST by Simon Tweed
Updated	2021-06-19 10:25:28 AEST by Simon Tweed
Location	-33.7005847776292, 150.289643616286
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:35:47 AEST by Simon Tweed
Updated	2021-06-19 10:36:17 AEST by Simon Tweed
Location	-33.7002865852435, 150.290065469697
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 11:53:21 AEDT by Simon Tweed
Updated	2020-11-26 11:57:20 AEDT by Simon Tweed
Location	-33.6984368, 150.2908745
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Tree
Species	Eucalyptus piperita
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-25 15:27:33 AEDT by Simon Tweed
Updated	2020-12-01 09:20:04 AEDT by Simon Tweed
Location	-33.6459106116411, 150.284655803706
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	30
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:09:44 AEST by Simon Tweed
Updated	2021-06-20 12:10:09 AEST by Simon Tweed
Location	-33.6614898878762, 150.278912287636
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	3
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:13:56 AEST by Simon Tweed
Updated	2021-06-20 11:14:19 AEST by Simon Tweed
Location	-33.6561283412191, 150.281111062272
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:57:31 AEST by Simon Tweed
Updated	2021-06-20 10:57:55 AEST by Simon Tweed
Location	-33.6545906725723, 150.281909110604
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	120
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:57:41 AEST by Simon Tweed
Updated	2021-06-20 11:58:02 AEST by Simon Tweed
Location	-33.6590549224355, 150.279124135736
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:17:45 AEST by Simon Tweed
Updated	2021-06-20 11:18:19 AEST by Simon Tweed
Location	-33.656537661158, 150.280773548086
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 000

Created	2021-06-17 18:16:27 AEST by Simon Tweed
Updated	2021-06-17 18:17:34 AEST by Simon Tweed
Location	-33.6532060213518, 150.28425693512
Project number	6171
Plot reference	000
PCT	1248
Type	Stag
Species	Eucalyptus spp.
DBH	25
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:25:00 AEST by Sarah Hart
Updated	2021-06-20 11:25:59 AEST by Sarah Hart
Location	-33.6572007250344, 150.280555139477
Project number	6171
Plot reference	0
PCT	1248
Type	Stag
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:57:22 AEST by Sarah Hart
Updated	2021-06-20 11:02:31 AEST by Sarah Hart
Location	-33.6555028221944, 150.281256523414
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	3
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt1

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 09:59:00 AEDT by Simon Tweed
Updated	2020-10-29 10:00:41 AEDT by Simon Tweed
Location	-33.6677162980028, 150.280348064062
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt1
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	2
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:07:13 AEST by Simon Tweed
Updated	2021-06-20 11:07:37 AEST by Simon Tweed
Location	-33.6551313791197, 150.281911228773
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:40:16 AEST by Sarah Hart
Updated	2021-06-20 11:40:51 AEST by Sarah Hart
Location	-33.6577757697551, 150.279495973605
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:15:58 AEST by Simon Tweed
Updated	2021-06-20 11:16:21 AEST by Simon Tweed
Location	-33.6564438477964, 150.281021990051
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 10:18:45 AEST by Simon Tweed
Updated	2021-06-19 10:19:27 AEST by Simon Tweed
Location	-33.7009570778063, 150.28959028739
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 20:42:14 AEST by Simon Tweed
Updated	2021-06-19 20:42:48 AEST by Simon Tweed
Location	-33.6577042745029, 150.280344491744
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus oreades
DBH	200
Hollows < 5cm	0
Hollows 5-10cm	3
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt12

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:56:24 AEDT by Simon Tweed
Updated	2020-10-29 10:57:13 AEDT by Simon Tweed
Location	-33.6663331665378, 150.28036438545
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt12
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:16:45 AEST by Simon Tweed
Updated	2021-06-20 11:17:14 AEST by Simon Tweed
Location	-33.6565058021266, 150.280998450682
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	30
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 12:22:04 AEDT by Simon Tweed
Updated	2020-11-26 12:22:59 AEDT by Simon Tweed
Location	-33.6987545009551, 150.290828347206
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Stag
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	2
Hollows 5-10cm	5
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:21:27 AEST by Sarah Hart
Updated	2021-06-20 12:21:52 AEST by Sarah Hart
Location	-33.6612742655263, 150.278660739659
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus piperita
DBH	60
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:31:04 AEST by Simon Tweed
Updated	2021-06-19 10:31:48 AEST by Simon Tweed
Location	-33.7005104377733, 150.290108868648
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus spp.
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:11:00 AEST by Simon Tweed
Updated	2021-06-20 12:11:26 AEST by Simon Tweed
Location	-33.661937964733, 150.278658797344
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-25 15:29:32 AEDT by Simon Tweed
Updated	2020-11-25 15:30:26 AEDT by Simon Tweed
Location	-33.6452270778962, 150.285050095029
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	40
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:56:24 AEST by Simon Tweed
Updated	2021-06-20 10:56:53 AEST by Simon Tweed
Location	-33.654498738884, 150.282491371036
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:15:06 AEST by Simon Tweed
Updated	2021-06-20 10:15:30 AEST by Simon Tweed
Location	-33.6521740241228, 150.285666323899
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	60
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt9

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:16:19 AEDT by Simon Tweed
Updated	2020-10-29 10:17:02 AEDT by Simon Tweed
Location	-33.6673756831723, 150.280445941594
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt9
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt2

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:01:05 AEDT by Simon Tweed
Updated	2020-10-29 10:01:45 AEDT by Simon Tweed
Location	-33.6678055382272, 150.280303464224
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt2
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt13

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 11:00:53 AEDT by Simon Tweed
Updated	2020-10-29 11:02:20 AEDT by Simon Tweed
Location	-33.6660099772307, 150.280329915544
Project number	6229
Plot reference	Hbt13
PCT	1248
Type	Tree
Species	Eucalyptus oreades
DBH	150
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	8

6171, 0

Created	2021-06-20 11:36:54 AEST by Simon Tweed
Updated	2021-06-20 11:37:24 AEST by Simon Tweed
Location	-33.6575367859038, 150.279993632129
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	40
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

617, 000

Created	2021-06-19 10:01:23 AEST by Simon Tweed
Updated	2021-06-19 10:02:05 AEST by Simon Tweed
Location	-33.702734022932, 150.290437750518
Project number	617
Plot reference	000
PCT	000
Type	Stag
Species	Eucalyptus spp.
DBH	30
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:40:25 AEST by Simon Tweed
Updated	2021-06-20 11:41:02 AEST by Simon Tweed
Location	-33.6578732953111, 150.279769736264
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus oreades
DBH	250
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt3

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:02:06 AEDT by Simon Tweed
Updated	2020-10-29 10:02:39 AEDT by Simon Tweed
Location	-33.6678628233973, 150.28029153259
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt3
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:47:49 AEST by Sarah Hart
Updated	2021-06-20 10:48:37 AEST by Sarah Hart
Location	-33.6546144903656, 150.281907829675
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus radiata
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:05:39 AEST by Sarah Hart
Updated	2021-06-20 11:06:16 AEST by Sarah Hart
Location	-33.655633373373, 150.281502663094
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	20
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP8 - FOY Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:56:02 AEDT by Simon Tweed
Updated	2020-10-28 16:57:22 AEDT by Simon Tweed
Location	-33.6857024234826, 150.28789841392
Project number	6229
Plot reference	RDP8 - FOY Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	3
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:29:45 AEST by Simon Tweed
Updated	2021-06-19 09:30:37 AEST by Simon Tweed
Location	-33.7023412777786, 150.289701463007
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus piperita
DBH	40
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt6

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:05:32 AEDT by Simon Tweed
Updated	2020-10-29 10:06:10 AEDT by Simon Tweed
Location	-33.6676573015111, 150.280551748975
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt6
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:11:27 AEST by Simon Tweed
Updated	2021-06-20 10:12:01 AEST by Simon Tweed
Location	-33.651877281735, 150.285481698811
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	5
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:06:07 AEST by Sarah Hart
Updated	2021-06-20 12:06:37 AEST by Sarah Hart
Location	-33.6597768548767, 150.278520695865
Project number	6171
Plot reference	0
PCT	1248
Type	Stag
Species	Eucalyptus spp.
DBH	30
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:04:56 AEST by Simon Tweed
Updated	2021-06-20 12:05:19 AEST by Simon Tweed
Location	-33.6603891391632, 150.278867097367
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:51:56 AEST by Simon Tweed
Updated	2021-06-20 10:52:36 AEST by Simon Tweed
Location	-33.6542634724365, 150.282860174775
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:14:53 AEST by Simon Tweed
Updated	2021-06-20 11:15:15 AEST by Simon Tweed
Location	-33.6563164347688, 150.280949105045
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-17 12:18:16 AEST by Simon Tweed
Updated	2021-06-17 12:19:26 AEST by Simon Tweed
Location	-33.7011938, 150.2899498
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 11:56:42 AEDT by Simon Tweed
Updated	2020-11-26 11:57:31 AEDT by Simon Tweed
Location	-33.6984501786222, 150.290770679712
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:34:39 AEST by Simon Tweed
Updated	2021-06-20 10:35:10 AEST by Simon Tweed
Location	-33.6533606596887, 150.28399927507
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:00:28 AEST by Sarah Hart
Updated	2021-06-20 11:01:14 AEST by Sarah Hart
Location	-33.6555729187974, 150.28105571866
Project number	6171
Plot reference	0
PCT	1248
Type	Stag
Species	Eucalyptus spp.
DBH	40
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:03:56 AEST by Sarah Hart
Updated	2021-06-20 12:04:35 AEST by Sarah Hart
Location	-33.6594096047079, 150.278591439128
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus oreades
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:01:13 AEST by Sarah Hart
Updated	2021-06-20 12:01:52 AEST by Sarah Hart
Location	-33.6590697015592, 150.278788581491
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus piperita
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:16:30 AEST by Sarah Hart
Updated	2021-06-20 12:17:16 AEST by Sarah Hart
Location	-33.6607248330595, 150.278584398329
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus piperita
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 11:08:23 AEST by Simon Tweed
Updated	2021-06-19 11:08:50 AEST by Simon Tweed
Location	-33.6562816197727, 150.280782550903
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, 14

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 13:07:48 AEDT by Simon Tweed
Updated	2020-10-29 13:09:02 AEDT by Simon Tweed
Location	-33.665187511764, 150.280138208998
Project number	6229
Plot reference	14
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	25
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:50:18 AEST by Sarah Hart
Updated	2021-06-20 10:51:05 AEST by Sarah Hart
Location	-33.6549974936139, 150.281696310301
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:12:28 AEST by Simon Tweed
Updated	2021-06-20 10:13:00 AEST by Simon Tweed
Location	-33.65193534611, 150.285313114599
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	0
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 10:43:35 AEDT by Simon Tweed
Updated	2020-11-26 10:45:22 AEDT by Simon Tweed
Location	-33.6977822, 150.2891646
Project number	6229
Plot reference	Hbt
PCT	Bm swamp
Type	Tree
Species	Eucalyptus oreades
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:43:49 AEST by Simon Tweed
Updated	2021-06-19 09:44:37 AEST by Simon Tweed
Location	-33.7024549108153, 150.290432306786
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	120
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	2
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:48:55 AEST by Simon Tweed
Updated	2021-06-20 10:49:27 AEST by Simon Tweed
Location	-33.6539598145385, 150.283141739327
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	1
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:56:09 AEST by Simon Tweed
Updated	2021-06-20 11:56:37 AEST by Simon Tweed
Location	-33.6588986899854, 150.27921289569
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	30
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

5144, TFNSW - MB2BH NPWS land hbt4

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:02:56 AEDT by Simon Tweed
Updated	2020-10-29 10:03:39 AEDT by Simon Tweed
Location	-33.667903927285, 150.28022863416
Project number	5144
Plot reference	TFNSW - MB2BH NPWS land hbt4
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	2
Hollows 21-30cm	1
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 11:54:56 AEDT by Simon Tweed
Updated	2020-11-26 11:55:32 AEDT by Simon Tweed
Location	-33.6983947, 150.2908405
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Stag
Species	Eucalyptus piperita
DBH	80
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-18 12:39:59 AEST by Simon Tweed
Updated	2021-06-18 12:40:30 AEST by Simon Tweed
Location	-33.6689288, 150.2801692
Project number	6171
Plot reference	000
PCT	926
Type	Tree
Species	Eucalyptus viminalis
DBH	100
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:04:39 AEST by Sarah Hart
Updated	2021-06-20 11:05:18 AEST by Sarah Hart
Location	-33.6556588505236, 150.281446192378
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	25
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 09:40:22 AEST by Simon Tweed
Updated	2021-06-19 09:40:58 AEST by Simon Tweed
Location	-33.7022802053235, 150.2903970047
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	2
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, -

Created	2021-06-20 10:40:47 AEST by Sarah Hart
Updated	2021-06-20 10:41:36 AEST by Sarah Hart
Location	-33.6541075253601, 150.282425013649
Project number	6171
Plot reference	-
PCT	1248
Type	Stag
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-17 12:16:24 AEST by Simon Tweed
Updated	2021-06-17 12:16:57 AEST by Simon Tweed
Location	-33.7010225, 150.289814
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	120
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:09:24 AEST by Sarah Hart
Updated	2021-06-20 12:09:58 AEST by Sarah Hart
Location	-33.6600686167636, 150.278509373954
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	40
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:06:47 AEST by Sarah Hart
Updated	2021-06-20 12:07:21 AEST by Sarah Hart
Location	-33.6599378751631, 150.278527401388
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus piperita
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-17 18:13:29 AEST by Simon Tweed
Updated	2021-06-17 18:14:09 AEST by Simon Tweed
Location	-33.6528829, 150.2842262
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	150
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, TFNSW - MB2BH NPWS land hbt8

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:08:44 AEDT by Simon Tweed
Updated	2020-10-29 10:09:57 AEDT by Simon Tweed
Location	-33.6674862349548, 150.280287265778
Project number	6229
Plot reference	TFNSW - MB2BH NPWS land hbt8
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	150
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:46:33 AEST by Simon Tweed
Updated	2021-06-20 11:47:18 AEST by Simon Tweed
Location	-33.6585913790904, 150.279744789004
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	5
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:07:51 AEST by Simon Tweed
Updated	2021-06-20 11:08:16 AEST by Simon Tweed
Location	-33.6551153472049, 150.281829172455
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:54:18 AEST by Sarah Hart
Updated	2021-06-20 10:55:02 AEST by Sarah Hart
Location	-33.6553346560829, 150.281552847955
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:05:16 AEST by Simon Tweed
Updated	2021-06-20 10:06:24 AEST by Simon Tweed
Location	-33.6523328801968, 150.285138229251
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sclerophylla
DBH	60
Hollows < 5cm	3
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-17 17:54:50 AEST by Simon Tweed
Updated	2021-06-17 17:55:33 AEST by Simon Tweed
Location	-33.6522641, 150.285927
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus sclerophylla
DBH	50
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 11:29:21 AEST by Simon Tweed
Updated	2021-06-19 11:31:05 AEST by Simon Tweed
Location	-33.653898088392, 150.28381597373
Project number	6171
Plot reference	0
PCT	0
Type	Stag
Species	Eucalyptus spp.
DBH	45
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-17 17:58:46 AEST by Simon Tweed
Updated	2021-06-17 17:59:30 AEST by Simon Tweed
Location	-33.652327, 150.2857
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	100
Hollows < 5cm	3
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:05:25 AEST by Simon Tweed
Updated	2021-06-20 11:05:49 AEST by Simon Tweed
Location	-33.6551543686276, 150.282290039613
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	40
Hollows < 5cm	2
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:47:54 AEST by Sarah Hart
Updated	2021-06-20 11:48:24 AEST by Sarah Hart
Location	-33.6583098962009, 150.279238926675
Project number	6171
Plot reference	0
PCT	1248
Type	Stag
Species	Eucalyptus spp.
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, -

Created	2021-06-20 10:46:19 AEST by Sarah Hart
Updated	2021-06-20 10:46:59 AEST by Sarah Hart
Location	-33.6544845098467, 150.282035517183
Project number	6171
Plot reference	-
PCT	1248
Type	Stag
Species	Eucalyptus spp.
DBH	15
Hollows < 5cm	0
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, Hbt

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 12:25:05 AEDT by Simon Tweed
Updated	2020-11-26 12:25:41 AEDT by Simon Tweed
Location	-33.6993098655137, 150.290505476296
Project number	6229
Plot reference	Hbt
PCT	1248
Type	Stag
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	5
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:07:46 AEST by Simon Tweed
Updated	2021-06-20 12:08:12 AEST by Simon Tweed
Location	-33.6612705747438, 150.279169262294
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	45
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 10:27:27 AEST by Simon Tweed
Updated	2021-06-20 10:27:53 AEST by Simon Tweed
Location	-33.6530565495092, 150.284407036708
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	90
Hollows < 5cm	2
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, RDP8 - Foy Avenue

Project	6229 GWH Biodiversity Surveys
Created	2020-10-28 16:37:06 AEDT by Simon Tweed
Updated	2020-10-28 16:37:48 AEDT by Simon Tweed
Location	-33.6863586618382, 150.28839810473
Project number	6229
Plot reference	RDP8 - Foy Avenue
PCT	000
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	8
Hollows 21-30cm	8
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:34:35 AEST by Simon Tweed
Updated	2021-06-19 10:34:58 AEST by Simon Tweed
Location	-33.7003385305931, 150.289829693118
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	60
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 10:10:12 AEST by Simon Tweed
Updated	2021-06-19 10:10:41 AEST by Simon Tweed
Location	-33.7012106146405, 150.289757759638
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus piperita
DBH	30
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:01:46 AEST by Simon Tweed
Updated	2021-06-20 12:02:09 AEST by Simon Tweed
Location	-33.6598511582193, 150.278886214605
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	30
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:28:41 AEST by Sarah Hart
Updated	2021-06-20 11:29:18 AEST by Sarah Hart
Location	-33.6571263515396, 150.280318210807
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus sieberi
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:58:02 AEST by Sarah Hart
Updated	2021-06-20 11:58:32 AEST by Sarah Hart
Location	-33.6587869454234, 150.278945041979
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus piperita
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-19 10:29:57 AEST by Simon Tweed
Updated	2021-06-19 10:30:25 AEST by Simon Tweed
Location	-33.7005579912098, 150.290064806843
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus piperita
DBH	80
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-19 10:05:19 AEST by Simon Tweed
Updated	2021-06-19 10:05:53 AEST by Simon Tweed
Location	-33.7017512432004, 150.290250320677
Project number	6171
Plot reference	000
PCT	000
Type	Tree
Species	Eucalyptus piperita
DBH	200
Hollows < 5cm	1
Hollows 5-10cm	5
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:58:20 AEST by Simon Tweed
Updated	2021-06-20 11:58:44 AEST by Simon Tweed
Location	-33.6590517468582, 150.27905863378
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	90
Hollows < 5cm	1
Hollows 5-10cm	0
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-18 12:32:59 AEST by Simon Tweed
Updated	2021-06-18 12:33:38 AEST by Simon Tweed
Location	-33.669016667693, 150.280569326409
Project number	6171
Plot reference	000
PCT	926
Type	Tree
Species	Eucalyptus spp.
DBH	150
Hollows < 5cm	2
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:59:36 AEST by Sarah Hart
Updated	2021-06-20 12:00:05 AEST by Sarah Hart
Location	-33.658993674446, 150.278833541932
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus piperita
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	2
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 12:10:16 AEST by Sarah Hart
Updated	2021-06-20 12:10:41 AEST by Sarah Hart
Location	-33.6600927591759, 150.278577974616
Project number	6171
Plot reference	0
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	100
Hollows < 5cm	1
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 0

Created	2021-06-20 11:08:44 AEST by Simon Tweed
Updated	2021-06-20 11:09:15 AEST by Simon Tweed
Location	-33.6552776532206, 150.282028019428
Project number	6171
Plot reference	0
PCT	0
Type	Tree
Species	Eucalyptus sieberi
DBH	80
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	1
Hollows 21-30cm	0
Hollows > 30cm	0

6171, 000

Created	2021-06-18 13:19:11 AEST by Simon Tweed
Updated	2021-06-18 13:19:51 AEST by Simon Tweed
Location	-33.6629691, 150.2783656
Project number	6171
Plot reference	000
PCT	1248
Type	Tree
Species	Eucalyptus spp.
DBH	50
Hollows < 5cm	0
Hollows 5-10cm	1
Hollows 11-20cm	0
Hollows 21-30cm	0
Hollows > 30cm	0

6229, MB2BH NPWS , Echolocation recording, 2020-10-29, 16:31

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 16:31:30 AEDT by Simon Tweed
Updated	2020-11-25 15:57:40 AEDT by Simon Tweed
Location	-33.6690290325905, 150.280515253544

Site details

Project number	6229
Project name	GWH
Observers	Kayla Asplet
Site name or no.	MB2BH NPWS
Survey Type	Echolocation recording
Trap/cam (more than 1 day)	Yes
Trap no.	872
Start Date	2020-10-29
Start Time	16:31
End date	2020-11-25
Effort (trap more than 1 night)	27
Habitat notes	Please check Device ID on pick-up...it was deployed without recording code. SMBAT4 device

Photo site	 
Address-site	Cox Avenue Blue Mountains, NSW 2570

6229, K2MB, Remote camera, 2020-11-26, 12:16

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 12:16:14 AEDT by Simon Tweed
Updated	2020-12-02 15:00:22 AEDT by Simon Tweed
Location	-33.6984852, 150.2907105

Site details

Project number	6229
Project name	GWH - K2MB
Observers	Sarah Hart, Kayla Asplet
Site name or no.	K2MB
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	870
Start Date	2020-11-26
Start Time	12:16
End date	2020-12-15
Effort (trap more than 1 night)	19

Photo site	
	
Address-site	416 Great Western Highway Katoomba, New South Wales 2780

Mammalia, Swamp Wallaby ; Wallabia bicolor, 2020-12-12, 13:09

Date captured	2020-12-12
Time	13:09
Species (use search box)	Mammalia, Swamp Wallaby ; Wallabia bicolor
No of individuals (if>1)	1

Obs Type	Observed

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	K2MB

Mammalia, kangaroo / wallaby ; Macropus sp., 2020-12-09, 13:09

Date captured	2020-12-09
Time	13:09
Species (use search box)	Mammalia, kangaroo / wallaby ; Macropus sp.
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	K2MB

Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus, 2020-12-12, 13:10

Date captured	2020-12-12
Time	13:10
Species (use search box)	Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	K2MB

Created	2021-06-17 12:56:37 AEST by Cairo Forrest
Updated	2021-06-17 12:56:37 AEST by Cairo Forrest
Location	-33.6645527777778, 150.27995

6229, BH2LH long tunnel entance, Remote camera, 2020-10-20, 17:06

Project	6229 GWH Biodiversity Surveys
Created	2020-10-20 17:06:18 AEDT by Simon Tweed
Updated	2021-02-02 14:21:53 AEDT by Simon Tweed
Location	-33.645462426635, 150.284731350839

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2LH long tunnel entance
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	122
Start Date	2020-10-20
Start Time	17:06
End date	2020-11-24
Effort (trap more than 1 night)	35
Photo site	
Address-site	Blackheath, NSW 2785

Mammalia, Fox ; Vulpes vulpes, 2021-01-07, 14:49

Date captured	2021-01-07
Time	14:49
Species (use search box)	Mammalia, Fox ; Vulpes vulpes
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229

Site name or no (dup auto)	BH2LH long tunnel entance

Mammalia, Swamp Wallaby ; Wallabia bicolor, 2021-01-07, 14:49

Date captured	2021-01-07
Time	14:49
Species (use search box)	Mammalia, Swamp Wallaby ; Wallabia bicolor
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entance

Mammalia, Common Brushtail Possum ; Trichosurus vulpecula, 2021-01-07, 14:49

Date captured	2021-01-07
Time	14:49
Species (use search box)	Mammalia, Common Brushtail Possum ; Trichosurus vulpecula
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entance

6171, Spot1foytodelmonte, Spotlighting, 2021-06-18, 18:29

Created	2021-06-18 18:29:58 AEST by Simon Tweed
Updated	2021-06-18 18:41:20 AEST by Simon Tweed
Location	-33.6849091365611, 150.287047910579

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Spot1foytodelmonte
Survey Type	Spotlighting
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-18
Start Time	18:29
End Time	18:41
Effort (non-trap)	0.4
Address-site	9-15 Foy Avenue Medlow Bath, NSW 2780

Created	2021-06-17 12:56:38 AEST by Cairo Forrest
Updated	2021-06-17 12:56:38 AEST by Cairo Forrest
Location	-33.6689388888889, 150.280488888889

Created	2021-06-17 12:56:38 AEST by Cairo Forrest
Updated	2021-06-17 12:56:38 AEST by Cairo Forrest
Location	-33.6628861111111, 150.278844444444

6171, MB2BH, Incidental observations, 2021-06-19, 12:11

Created	2021-06-19 12:11:34 AEST by Simon Tweed
Updated	2021-06-19 12:12:30 AEST by Simon Tweed
Location	-33.6539865758103, 150.284130001049

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	MB2BH
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	12:11
End Time	12:11
Effort (non-trap)	24
Address-site	B4 Realton Creek Trail Blackheath, NSW 2785

Aves, Crimson Rosella ; Platycercus elegans, 2021-06-19, 12:11

Date captured	2021-06-19
Time	12:11
Species (use search box)	Aves, Crimson Rosella ; Platycercus elegans
No of individuals (if>1)	1
Obs Type	Hair, feathers or skin
ID certain	Yes

Photos	
Microhabitat	IL In litter

Auto fields

Project no (dup auto)	6171

Created	2021-06-17 12:56:33 AEST by Cairo Forrest
Updated	2021-06-17 12:56:33 AEST by Cairo Forrest
Location	-33.6518194444444, 150.285108333333

6171, Potential stagwatch location, Incidental observations, 2021-06-16, 10:27

Created	2021-06-16 10:27:57 AEST by Simon Tweed
Updated	2021-06-16 10:29:05 AEST by Simon Tweed
Location	-33.6862432029532, 150.288414023817

Site details

Project number	6171
Project name	GWHE
Observers	Kayla Asplet
Site name or no.	Potential stagwatch location
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-16
Start Time	10:27
End Time	10:29
Effort (non-trap)	0.0333333333333333
Photo site	
Address-site	Great Western Highway Medlow Bath, NSW 2780

6171, Mbsbhsouth-spot2, Spotlighting, 2021-06-17, 18:50

Created	2021-06-17 19:14:01 AEST by Simon Tweed
Updated	2021-06-17 19:14:48 AEST by Simon Tweed
Location	-33.668669, 150.2801

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Mbsbhsouth-spot2
Survey Type	Spotlighting
accuracy	undefined
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-17
Start Time	18:50
End Time	19:14
Effort (non-trap)	0.8
Habitat notes	Wet sclerophyll
Address-site	35 Station Street Medlow Bath, New South Wales 2780

6229, BH2MV short portal, Remote camera, 2020-10-21, 09:42

Created	2020-10-21 09:42:35 AEDT by Simon Tweed
Updated	2021-01-07 15:35:36 AEDT by Simon Tweed
Location	-33.6516659496511, 150.285849660936

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2MV short portal
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	120
Start Date	2020-10-21
Start Time	09:42
End date	2020-11-26
Effort (trap more than 1 night)	36
Habitat notes	Scoutguard device - sweet bait

Photo site	
	
Address-site	12–24 Seaforth Road Blackheath, NSW 2785

Reptilia, Blotched Blue-tongue ; Tiliqua nigrolutea, 2021-01-07, 14:54

Date captured	2021-01-07
Time	14:54
Species (use search box)	Reptilia, Blotched Blue-tongue ; Tiliqua nigrolutea
No of individuals (if>1)	1

Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short portal

Aves, Pied Currawong ; Strepera graculina, 2021-01-07, 14:55

Date captured	2021-01-07
Time	14:55
Species (use search box)	Aves, Pied Currawong ; Strepera graculina
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short portal

Mammalia, Swamp Wallaby ; Wallabia bicolor, 2021-01-07, 14:55

Date captured	2021-01-07
Time	14:55
Species (use search box)	Mammalia, Swamp Wallaby ; Wallabia bicolor
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short portal

Mammalia, Fox ; Vulpes vulpes, 2021-01-07, 14:55

Date captured	2021-01-07
Time	14:55
Species (use search box)	Mammalia, Fox ; Vulpes vulpes
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short portal

6171, Nelliesglen spot1, Incidental observations, 2021-06-16, 18:13

Created	2021-06-16 18:13:39 AEST by Simon Tweed
Updated	2021-06-16 20:51:39 AEST by Simon Tweed
Location	-33.703813, 150.2902789

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Nelliesglen spot1
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-16
Start Time	18:13
End Time	18:14
Effort (non-trap)	0.0333333333333333
Habitat notes	Driving at 10 km/h spotlighting transect via car in this section. 8 degrees Celsius, drizzle and NW winds. No fauna identified.
Address-site	386 Great Western Highway Katoomba, New South Wales 2780

Created	2021-06-17 12:57:39 AEST by Cairo Forrest
Updated	2021-06-17 12:57:39 AEST by Cairo Forrest
Location	-33.6997138888889, 150.320830555556

6229, BH2LH long tunnel entrance, Remote camera, 2020-10-20, 18:02

Project	6229 GWH Biodiversity Surveys
Created	2020-10-20 18:02:34 AEDT by Simon Tweed
Updated	2020-12-01 10:34:33 AEDT by Simon Tweed
Location	-33.6465177399929, 150.28600640595

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2LH long tunnel entrance
Survey Type	Remote camera
accuracy	undefined
Trap/cam (more than 1 day)	Yes
Trap no.	88
Start Date	2020-10-20
Start Time	18:02
End date	2020-11-24
Effort (trap more than 1 night)	35
Photo site	
Address-site	2 Valley View Road Blackheath, NSW 2785

Mammalia, Bush Rat ; Rattus fuscipes, 2021-01-07, 14:46

Date captured	2021-01-07
Time	14:46
Species (use search box)	Mammalia, Bush Rat ; Rattus fuscipes
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Created	2021-06-17 12:56:33 AEST by Cairo Forrest
Updated	2021-06-17 12:56:33 AEST by Cairo Forrest
Location	-33.6452333333333, 150.285494444444

6171, MB2BHspot2, Spotlighting, 2021-06-17, 17:25

Created	2021-06-17 18:05:35 AEST by Simon Tweed
Updated	2021-06-17 18:53:29 AEST by Simon Tweed
Location	-33.6524954649739, 150.284810476005

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	MB2BHspot2
Survey Type	Spotlighting
accuracy	undefined
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-17
Start Time	17:25
End Time	18:53
Effort (non-trap)	2.933333333333333
Habitat notes	Swamp veg and put 1248
Address-site	10 Seaforth Road Blue Mountains National Park, New South Wales 2778

6229, BH2MV short tunnel entrance, Remote camera, 2020-10-21, 09:16

Project	6229 GWH Biodiversity Surveys
Created	2020-10-21 09:16:58 AEDT by Simon Tweed
Updated	2020-12-03 13:30:13 AEDT by Simon Tweed
Location	-33.6517709481885, 150.28500828892

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2MV short tunnel entrance
Survey Type	Remote camera
accuracy	undefined
Trap/cam (more than 1 day)	Yes
Trap no.	113
Start Date	2020-10-21
Start Time	09:16
End date	2020-11-26
Effort (trap more than 1 night)	36
Photo site	
Address-site	Blackheath, NSW 2785

Mammalia, Brown Antechinus ; Antechinus stuartii, 2021-01-07, 14:56

Date captured	2021-01-07
Time	14:56

Species (use search box)	Mammalia, Brown Antechinus ; Antechinus stuartii
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, Australian Magpie ; Cracticus tibicen, 2021-01-07, 14:56

Date captured	2021-01-07
Time	14:56
Species (use search box)	Aves, Australian Magpie ; Cracticus tibicen
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, Eastern Koel ; Eudynamys orientalis, 2021-01-07, 14:57

Date captured	2021-01-07
Time	14:57
Species (use search box)	Aves, Eastern Koel ; Eudynamys orientalis
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Mammalia, Cat ; Felis catus, 2021-01-07, 14:57

Date captured	2021-01-07
Time	14:57
Species (use search box)	Mammalia, Cat ; Felis catus
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

6171, Site compound, Incidental observations, 2021-06-15, 14:52

Created	2021-06-15 14:52:05 AEST by Simon Tweed
Updated	2021-06-16 20:54:18 AEST by Simon Tweed
Location	-33.7002296108864, 150.320691727669

Site details

Project number	6171
Project name	GWHE
Observers	Kayla Asplet
Site name or no.	Site compound
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-15
Start Time	14:52
End Time	14:52
Effort (non-trap)	24
Habitat notes	Degraded site, dominated by exotics and planted natives. Previously cleared/disturbed ground
Photo site	

Address-site	46-56 Woodlands Road Katoomba, NSW 2780

Aves, Crimson Rosella ; Platycercus elegans, 2021-06-15, 14:52

Date captured	2021-06-15
Time	14:52
Species (use search box)	Aves, Crimson Rosella ; Platycercus elegans
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171

Aves, Pied Butcherbird ; Cracticus nigrogularis, 2021-06-15, 14:53

Date captured	2021-06-15
Time	14:53
Species (use search box)	Aves, Pied Butcherbird ; Cracticus nigrogularis
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171

Aves, Australian Magpie ; Cracticus tibicen, 2021-06-15, 14:54

Date captured	2021-06-15
Time	14:54

Species (use search box)	Aves, Australian Magpie ; Cracticus tibicen
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171

6229, K2MB, Echolocation recording, 2020-11-26, 13:15

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 13:15:04 AEDT by Simon Tweed
Updated	2020-12-15 14:53:49 AEDT by Simon Tweed
Location	-33.6920313565762, 150.290136685606

Site details

Project number	6229
Project name	Tahmoor south
Observers	Sarah Hart, Kayla Asplet
Site name or no.	K2MB
Survey Type	Echolocation recording
Trap/cam (more than 1 day)	Yes
Trap no.	871
Start Date	2020-11-26
Start Time	13:15
End date	2020-12-15
Effort (trap more than 1 night)	19
Habitat notes	Along old easement off FireTrail
Photo site	
Address-site	Great Western Highway Katoomba, NSW 2780

6171, MB2BH south, Spotlighting, 2021-06-18, 18:55

Created	2021-06-18 18:55:24 AEST by Simon Tweed
Updated	2021-06-18 18:55:51 AEST by Simon Tweed
Location	-33.6688844962727, 150.28019761716

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	MB2BH south
Survey Type	Spotlighting
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-18
Start Time	18:55
End Time	18:55
Effort (non-trap)	24
Address-site	Great Western Highway Blue Mountains, NSW 2570

Created	2021-06-17 12:57:39 AEST by Cairo Forrest
Updated	2021-06-17 12:57:39 AEST by Cairo Forrest
Location	-33.7005138888889, 150.320552777778

6171, Mb2bh, Incidental observations, 2021-06-18, 12:55

Created	2021-06-18 12:55:30 AEST by Simon Tweed
Updated	2021-06-18 12:56:41 AEST by Simon Tweed
Location	-33.6657459, 150.2803017

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Mb2bh
Survey Type	Incidental observations
accuracy	undefined
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-18
Start Time	12:55
End Time	12:55
Effort (non-trap)	24
Photo site	
Address-site	176 A32 Blackheath, New South Wales 2785

Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus, 2021-06-18, 12:55

Date captured	2021-06-18
Time	12:55

Species (use search box)	Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus
No of individuals (if>1)	5
Obs Type	Observed
Observation notes	Foraging in banksias

Auto fields

Project no (dup auto)	6171
Address (dup auto)	[object Object]
Observer (dup auto)	[object Object]

6171, MB2BH, Incidental observations, 2021-06-15, 13:03

Created	2021-06-15 13:03:29 AEST by Simon Tweed
Updated	2021-06-15 13:05:33 AEST by Simon Tweed
Location	-33.6499447250388, 150.288987720907

Site details

Project number	6171
Project name	GWHE
Observers	Kayla Asplet
Site name or no.	MB2BH
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-15
Start Time	13:03
End Time	13:04
Effort (non-trap)	0.0166666666666667
Address-site	37 Evans Lookout Road Blackheath, NSW 2785

Aves, Lewin's Honeyeater ; Meliphaga lewinii, 2021-06-15, 13:04

Date captured	2021-06-15
Time	13:04
Species (use search box)	Aves, Lewin's Honeyeater ; Meliphaga lewinii
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	MB2BH

Aves, Red Wattlebird ; Anthochaera carunculata, 2021-06-15, 13:04

Date captured	2021-06-15
Time	13:04
Species (use search box)	Aves, Red Wattlebird ; Anthochaera carunculata
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	MB2BH

Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus, 2021-06-15, 13:04

Date captured	2021-06-15
Time	13:04
Species (use search box)	Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus
No of individuals (if>1)	1

Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	MB2BH

Aves, Noisy Friarbird ; Philemon corniculatus, 2021-06-15, 13:05

Date captured	2021-06-15
Time	13:05
Species (use search box)	Aves, Noisy Friarbird ; Philemon corniculatus
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	MB2BH

Created	2021-06-17 12:56:38 AEST by Cairo Forrest
Updated	2021-06-17 12:56:38 AEST by Cairo Forrest
Location	-33.6689111111111, 150.280469444444

6171, Nelliesspot1, Spotlighting, 2021-06-17, 19:27

Created	2021-06-17 19:27:04 AEST by Simon Tweed
Updated	2021-06-17 19:54:37 AEST by Simon Tweed
Location	-33.7036849, 150.2905653

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Nelliesspot1
Survey Type	Spotlighting
accuracy	undefined
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-17
Start Time	19:27
End Time	19:54
Effort (non-trap)	0.9
Address-site	386 Great Western Highway Katoomba, New South Wales 2780

6171, Spot3, Spotlighting, 2021-06-18, 17:45

Created	2021-06-18 17:45:02 AEST by Simon Tweed
Updated	2021-06-18 18:16:03 AEST by Simon Tweed
Location	-33.7033227, 150.290577

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Spot3
Survey Type	Spotlighting
accuracy	undefined
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-18
Start Time	17:45
End Time	18:15
Effort (non-trap)	1
Address-site	386 Great Western Highway Katoomba, New South Wales 2780

6171, Pulpit Hill, Incidental observations, 2021-06-19, 10:44

Created	2021-06-19 10:44:08 AEST by Simon Tweed
Updated	2021-06-19 10:45:11 AEST by Simon Tweed
Location	-33.7022026428047, 150.29027747539

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Pulpit Hill
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	10:44
End Time	10:44
Effort (non-trap)	24
Address-site	3 Nellies Glen Road Katoomba, NSW 2780

Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus, 2021-06-19, 10:44

Date captured	2021-06-19
Time	10:44
Species (use search box)	Aves, Yellow-tailed Black-Cockatoo ; Calyptorhynchus funereus
No of individuals (if>1)	1
Obs Type	Tracks, scratchings
Observation notes	Chewed banksia cones

Auto fields

Project no (dup auto)	6171

Created	2021-06-17 12:56:45 AEST by Cairo Forrest
Updated	2021-06-17 12:56:45 AEST by Cairo Forrest
Location	-33.6984599997222, 150.2907299

6171, Spot4, Spotlighting, 2021-06-19, 18:44

Created	2021-06-19 18:44:26 AEST by Simon Tweed
Updated	2021-06-19 19:23:33 AEST by Simon Tweed
Location	-33.7034330966451, 150.290328524661

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Spot4
Survey Type	Spotlighting
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-19
Start Time	18:44
End Time	19:23
Effort (non-trap)	1.3
Address-site	386 Great Western Highway Katoomba, NSW 2780

6171, Pulpit Hill, Incidental observations, 2021-06-19, 10:11

Created	2021-06-19 10:11:08 AEST by Simon Tweed
Updated	2021-06-19 10:16:44 AEST by Simon Tweed
Location	-33.7011837537278, 150.289707230085

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Pulpit Hill
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	10:11
End Time	10:11
Effort (non-trap)	24
Address-site	Great Western Highway Katoomba, NSW 2780

Mammalia, Fox ; Vulpes vulpes, 2021-06-19, 10:11

Date captured	2021-06-19
Time	10:11
Species (use search box)	Mammalia, Fox ; Vulpes vulpes
No of individuals (if>1)	1
Obs Type	Scat
ID certain	Yes

Auto fields

Project no (dup auto)	6171

6171, Pulpit Hill, Incidental observations, 2021-06-19, 09:48

Created	2021-06-19 09:48:21 AEST by Simon Tweed
Updated	2021-06-19 09:48:55 AEST by Simon Tweed
Location	-33.7030020638323, 150.29036204044

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Pulpit Hill
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	09:48
End Time	09:48
Effort (non-trap)	24
Address-site	386 Great Western Highway Katoomba, NSW 2780

Aves, Little Wattlebird ; Anthochaera chrysoptera, 2021-06-19, 09:48

Date captured	2021-06-19
Time	09:48
Species (use search box)	Aves, Little Wattlebird ; Anthochaera chrysoptera
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	Pulpit Hill

Aves, New Holland Honeyeater ; Phylidonyris novaehollandiae, 2021-06-19, 09:48

Date captured	2021-06-19
Time	09:48
Species (use search box)	Aves, New Holland Honeyeater ; Phylidonyris novaehollandiae
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	Pulpit Hill

Created	2021-06-17 12:57:39 AEST by Cairo Forrest
Updated	2021-06-17 12:57:39 AEST by Cairo Forrest
Location	-33.6852805555556, 150.268313888889

6229, Bh2lh, Incidental observations, 2020-11-24, 11:20

Project	6229 GWH Biodiversity Surveys
Created	2020-11-24 11:20:23 AEDT by Simon Tweed
Updated	2021-02-02 14:21:58 AEDT by Simon Tweed
Location	-33.645347831873, 150.285558703454

Site details

Project number	6229
Project name	GWH
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Bh2lh
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2020-11-24
Start Time	11:20
End Time	11:21
Effort (non-trap)	0.0166666666666667
Address-site	Blackheath, NSW 2785

Aves, Gang-gang Cockatoo ; ^^Callocephalon fimbriatum, 2020-11-24, 11:20

Date captured	2020-11-24
Time	11:20
Species (use search box)	Aves, Gang-gang Cockatoo ; ^^Callocephalon fimbriatum
No of individuals (if>1)	1
Obs Type	Observed and Heard call

Auto fields

Project no (dup auto)	6149

Aves, Eastern Koel ; Eudynamys orientalis, 2021-01-07, 14:52

Date captured	2021-01-07
Time	14:52
Species (use search box)	Aves, Eastern Koel ; Eudynamys orientalis
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6149

Aves, Sulphur-crested Cockatoo ; Cacatua galerita, 2021-01-07, 14:52

Date captured	2021-01-07
Time	14:52
Species (use search box)	Aves, Sulphur-crested Cockatoo ; Cacatua galerita
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6149

Aves, Laughing Kookaburra ; Dacelo novaeguineae, 2021-01-07, 14:52

Date captured	2021-01-07
Time	14:52
Species (use search box)	Aves, Laughing Kookaburra ; Dacelo novaeguineae
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6149

Aves, Striated Thornbill ; Acanthiza lineata, 2021-01-07, 14:52

Date captured	2021-01-07
Time	14:52
Species (use search box)	Aves, Striated Thornbill ; Acanthiza lineata
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6149

Aves, White-throated Treecreeper ; Cormobates leucophaea, 2021-01-07, 14:52

Date captured	2021-01-07
Time	14:52
Species (use search box)	Aves, White-throated Treecreeper ; Cormobates leucophaea
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6149

Aves, Pied Currawong ; Strepera graculina, 2021-01-07, 14:52

Date captured	2021-01-07
Time	14:52
Species (use search box)	Aves, Pied Currawong ; Strepera graculina
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6149

Aves, Australian Magpie ; Cracticus tibicen, 2021-01-07, 14:53

Date captured	2021-01-07
Time	14:53
Species (use search box)	Aves, Australian Magpie ; Cracticus tibicen

No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6149

6229, BH2LH (long tunnel), Incidental observations, 2020-11-24, 09:43

Project	6229 GWH Biodiversity Surveys
Created	2020-12-01 09:43:43 AEDT by Simon Tweed
Updated	2021-02-02 14:22:19 AEDT by Simon Tweed
Location	-33.6453683660755, 150.285729803145

Site details

Project number	6229
Project name	GWH sutton park
Observers	Sarah Hart, Kayla Asplet
Site name or no.	BH2LH (long tunnel)
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2020-11-24
Start Time	09:43
End Time	09:44
Effort (non-trap)	0.0166666666666667
Habitat notes	Flying above canopy to towards the north
Address-site	1-27 Hargraves Street Blackheath, New South Wales 2785

Aves, Gang-gang Cockatoo ; ^^Callocephalon fimbriatum, 2020-12-01, 09:45

Date captured	2020-12-01
Time	09:45
Species (use search box)	Aves, Gang-gang Cockatoo ; ^^Callocephalon fimbriatum
No of individuals (if>1)	1
Obs Type	Observed and Heard call
Observation notes	Incidental
ID certain	Yes
Microhabitat	AC Flying above canopy

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH (long tunnel)
Address (dup auto)	[object Object]
Observer (dup auto)	[object Object]

6229, MB2BH - NPWS surplus land, Remote camera, 2020-10-29, 10:44

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 10:44:08 AEDT by Simon Tweed
Updated	2020-11-27 11:38:55 AEDT by Simon Tweed
Location	-33.667200448535, 150.280706143044

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	MB2BH - NPWS surplus land
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	124
Start Date	2020-10-29
Start Time	10:44
End date	2020-11-27
Effort (trap more than 1 night)	29
Habitat notes	Deployed on banksia
Photo site	

Address-site	B4 Realton Creek Trail Blue Mountains, NSW 2570

Created	2021-06-17 12:56:37 AEST by Cairo Forrest
Updated	2021-06-17 12:56:37 AEST by Cairo Forrest
Location	-33.6645777777778, 150.279930555556

Created	2021-06-17 12:56:33 AEST by Cairo Forrest
Updated	2021-06-17 12:56:33 AEST by Cairo Forrest
Location	-33.6516472222222, 150.285880555556

Created	2021-06-17 12:56:38 AEST by Cairo Forrest
Updated	2021-06-17 12:56:38 AEST by Cairo Forrest
Location	-33.6628833333333, 150.27885

6171, M2BHspot1, Spotlighting, 2021-06-16, 18:57

Created	2021-06-16 18:57:07 AEST by Simon Tweed
Updated	2021-06-16 20:52:54 AEST by Simon Tweed
Location	-33.6675767, 150.2801703

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	M2BHspot1
Survey Type	Spotlighting
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-16
Start Time	18:57
End Time	20:08
Effort (non-trap)	2.36666666666667
Habitat notes	PCT1248 - 8 degrees Celsius, light drizzle and NW winds. Large volumes of noise during survey from cars and trains.
Address-site	Great Western Highway Blue Mountains National Park, New South Wales 2785

Mammalia, long-eared bat ; Nyctophilus sp., 2021-06-16, 20:09

Date captured	2021-06-16
Time	20:09
Species (use search box)	Mammalia, long-eared bat ; Nyctophilus sp.
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	M2BHspot1
Address (dup auto)	[object Object]
Observer (dup auto)	[object Object]

6171, MB2BH , Incidental observations, 2021-06-19, 11:43

Created	2021-06-19 11:43:09 AEST by Simon Tweed
Updated	2021-06-19 11:45:15 AEST by Simon Tweed
Location	-33.654209378931, 150.283649074747

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	MB2BH
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	11:43
End Time	11:43
Effort (non-trap)	24
Address-site	B4 Realton Creek Trail Blackheath, NSW 2785

Aves, Brown Treecreeper (eastern subspecies) ; Climacteris picumnus victoriae, 2021-06-19, 11:43

Date captured	2021-06-19
Time	11:43
Species (use search box)	Aves, Brown Treecreeper (eastern subspecies) ; Climacteris picumnus victoriae
No of individuals (if>1)	1
Obs Type	Observed
ID certain	Yes
Microhabitat	UC Upper canopy

Auto fields

Project no (dup auto)	6171

Aves, Eastern Yellow Robin ; Eopsaltria australis, 2021-06-19, 11:44

Date captured	2021-06-19
Time	11:44
Species (use search box)	Aves, Eastern Yellow Robin ; Eopsaltria australis
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	MB2BH

Aves, Striated Pardalote ; Pardalotus striatus, 2021-06-19, 11:44

Date captured	2021-06-19
Time	11:44
Species (use search box)	Aves, Striated Pardalote ; Pardalotus striatus

No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	MB2BH

Created	2021-06-17 12:56:37 AEST by Cairo Forrest
Updated	2021-06-17 12:56:37 AEST by Cairo Forrest
Location	-33.6672222222222, 150.280691666667

6299, MB2BH, Remote camera, 2020-10-29, 13:28

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 13:28:51 AEDT by Simon Tweed
Updated	2020-11-27 11:48:03 AEDT by Simon Tweed
Location	-33.6646019158938, 150.279795351505

Site details

Project number	6299
Project name	Highways
Observers	Sarah Hart, Kayla Asplet
Site name or no.	MB2BH
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	85
Start Date	2020-10-29
Start Time	13:28
End date	2020-11-27
Effort (trap more than 1 night)	29

Photo site	 
Address-site	B4 Realton Creek Trail Blue Mountains, NSW 2570

6171, Pulpit Hill, Incidental observations, 2021-06-19, 09:32

Created	2021-06-19 09:32:09 AEST by Simon Tweed
Updated	2021-06-19 09:32:37 AEST by Simon Tweed
Location	-33.7023668483064, 150.289815872878

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Pulpit Hill
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	09:32
End Time	09:32
Effort (non-trap)	24
Address-site	3 Nellies Glen Road Katoomba, NSW 2780

Aves, Superb Lyrebird ; Menura novaehollandiae, 2021-06-19, 09:32

Date captured	2021-06-19
Time	09:32
Species (use search box)	Aves, Superb Lyrebird ; Menura novaehollandiae
No of individuals (if>1)	1
Obs Type	Observed
ID certain	Yes

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	Pulpit Hill

6229, K2MB, Remote camera, 2020-11-26, 13:34

Project	6229 GWH Biodiversity Surveys
Created	2020-11-26 13:34:04 AEDT by Simon Tweed
Updated	2020-12-01 11:25:32 AEDT by Simon Tweed
Location	-33.6918977, 150.2903166

Site details

Project number	6229
Project name	GWH - K2MB
Observers	Sarah Hart, Kayla Asplet
Site name or no.	K2MB
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	141
Start Date	2020-11-26
Start Time	13:34
End date	2020-12-15
Effort (trap more than 1 night)	19
Habitat notes	In heath

Photo site	
	
Address-site	Great Western Highway Katoomba, New South Wales 2780

6229, BH2LH long tunnel entrance, Remote camera, 2020-10-20, 17:39

Project	6229 GWH Biodiversity Surveys
Created	2020-10-20 17:39:57 AEDT by Simon Tweed
Updated	2021-02-02 14:21:55 AEDT by Simon Tweed
Location	-33.6457965222132, 150.285763666034

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2LH long tunnel entrance
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	87
Start Date	2020-10-20
Start Time	17:39
End date	2020-11-24
Effort (trap more than 1 night)	35
Photo site	
Address-site	113-125 Great Western Highway Blackheath, NSW 2785

Aves, Satin Bowerbird ; Ptilonorhynchus violaceus, 2021-01-07, 14:45

Date captured	2021-01-07
Time	14:45
Species (use search box)	Aves, Satin Bowerbird ; Ptilonorhynchus violaceus
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229

Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Common Brushtail Possum ; Trichosurus vulpecula, 2021-01-07, 14:45

Date captured	2021-01-07
Time	14:45
Species (use search box)	Mammalia, Common Brushtail Possum ; Trichosurus vulpecula
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

6229, BH2LH long tunnel entrance, Echolocation recording, 2020-10-20, 17:31

Project	6229 GWH Biodiversity Surveys
Created	2020-10-20 17:31:05 AEDT by Simon Tweed
Updated	2020-12-01 10:34:44 AEDT by Simon Tweed
Location	-33.6457510272357, 150.28592761606

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2LH long tunnel entrance
Survey Type	Echolocation recording
accuracy	undefined
Trap/cam (more than 1 day)	Yes
Trap no.	258
Start Date	2020-10-20
Start Time	17:31
End date	2020-11-06
Effort (trap more than 1 night)	17
Photo site	
Address-site	113-125 Great Western Highway Blackheath, NSW 2785

Mammalia, White-striped Freetail-bat ; Austronomus australis, 2021-01-07, 14:40

Date captured	2021-01-07

Time	14:40
Species (use search box)	Mammalia, White-striped Freetail-bat ; Austronomus australis
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Gould's Wattled Bat ; Chalinolobus gouldii, 2021-01-07, 14:41

Date captured	2021-01-07
Time	14:41
Species (use search box)	Mammalia, Gould's Wattled Bat ; Chalinolobus gouldii
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Chocolate Wattled Bat ; Chalinolobus morio, 2021-01-07, 14:41

Date captured	2021-01-07
Time	14:41
Species (use search box)	Mammalia, Chocolate Wattled Bat ; Chalinolobus morio
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Little Bentwing-bat ; Miniopterus australis, 2021-01-07, 14:41

Date captured	2021-01-07
Time	14:41
Species (use search box)	Mammalia, Little Bentwing-bat ; Miniopterus australis
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Eastern Bentwing-bat ; Miniopterus schreibersii oceanensis, 2021-01-07, 14:41

Date captured	2021-01-07
Time	14:41
Species (use search box)	Mammalia, Eastern Bentwing-bat ; Miniopterus schreibersii oceanensis
No of individuals (if>1)	1

Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Southern Myotis ; Myotis macropus, 2021-01-07, 14:42

Date captured	2021-01-07
Time	14:42
Species (use search box)	Mammalia, Southern Myotis ; Myotis macropus
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, long-eared bat ; Nyctophilus sp., 2021-01-07, 14:42

Date captured	2021-01-07
Time	14:42
Species (use search box)	Mammalia, long-eared bat ; Nyctophilus sp.
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Eastern Free-tailed Bat ; Mormopterus ridei, 2021-01-07, 14:42

Date captured	2021-01-07
Time	14:42
Species (use search box)	Mammalia, Eastern Free-tailed Bat ; Mormopterus ridei
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, ; Rhinolophus megaphyllus megaphyllus, 2021-01-07, 14:42

Date captured	2021-01-07
Time	14:42
Species (use search box)	Mammalia, ; Rhinolophus megaphyllus megaphyllus
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Yellow-bellied Sheathtail-bat ; Saccolaimus flaviventris, 2021-01-07, 14:42

Date captured	2021-01-07
Time	14:42
Species (use search box)	Mammalia, Yellow-bellied Sheathtail-bat ; Saccolaimus flaviventris
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Greater Broad-nosed Bat ; Scoteanax rueppellii, 2021-01-07, 14:43

Date captured	2021-01-07
Time	14:43
Species (use search box)	Mammalia, Greater Broad-nosed Bat ; Scoteanax rueppellii
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Large Forest Bat ; Vespadelus darlingtoni, 2021-01-07, 14:43

Date captured	2021-01-07
Time	14:43
Species (use search box)	Mammalia, Large Forest Bat ; Vespadelus darlingtoni
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

Mammalia, Little Forest Bat ; Vespadelus vulturnus, 2021-01-07, 14:43

Date captured	2021-01-07
Time	14:43
Species (use search box)	Mammalia, Little Forest Bat ; Vespadelus vulturnus
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH long tunnel entrance

6229, BH2MV short tunnel entrance, Remote camera, 2020-10-21, 09:50

Project	6229 GWH Biodiversity Surveys
Created	2020-10-21 09:50:25 AEDT by Simon Tweed
Updated	2021-02-02 15:01:26 AEDT by Simon Tweed
Location	-33.6509359043281, 150.285457894206

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2MV short tunnel entrance
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	93
Start Date	2020-10-21
Start Time	09:50
End date	2020-11-26
Effort (trap more than 1 night)	36
Photo site	
Address-site	12–24 Seaforth Road Blackheath, NSW 2785

Mammalia, Common Brushtail Possum ; Trichosurus vulpecula, 2021-01-07, 15:00

Date captured	2021-01-07
Time	15:00
Species (use search box)	Mammalia, Common Brushtail Possum ; Trichosurus vulpecula
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229

Site name or no (dup auto)	BH2MV short tunnel entrance

Mammalia, Cat ; Felis catus, 2021-01-07, 15:00

Date captured	2021-01-07
Time	15:00
Species (use search box)	Mammalia, Cat ; Felis catus
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, Australian Magpie ; Cracticus tibicen, 2021-01-07, 15:00

Date captured	2021-01-07
Time	15:00
Species (use search box)	Aves, Australian Magpie ; Cracticus tibicen
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, Eastern Koel ; Eudynamys orientalis, 2021-01-07, 15:00

Date captured	2021-01-07
Time	15:00
Species (use search box)	Aves, Eastern Koel ; Eudynamys orientalis
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

6299, MB2BH, Remote camera, 2020-10-29, 11:57

Project	6229 GWH Biodiversity Surveys
Created	2020-10-29 13:55:09 AEDT by Simon Tweed
Updated	2020-11-27 11:57:58 AEDT by Simon Tweed
Location	-33.6628639874284, 150.278882293089

Site details

Project number	6299
Project name	Highways
Observers	Sarah Hart, Kayla Asplet
Site name or no.	MB2BH
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	155
Start Date	2020-10-29
Start Time	11:57
End date	2020-11-27
Effort (trap more than 1 night)	29
Habitat notes	Check camera number!

Photo site	
	
Address-site	B4 Realton Creek Trail Blue Mountains, NSW 2570

6229, BH2MV short tunnel entrance , Remote camera, 2020-10-21, 10:00

Project	6229 GWH Biodiversity Surveys
Created	2020-10-21 10:00:51 AEDT by Simon Tweed
Updated	2021-02-02 15:02:06 AEDT by Simon Tweed
Location	-33.6509618600246, 150.285978578031

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2MV short tunnel entrance
Survey Type	Remote camera
Trap/cam (more than 1 day)	Yes
Trap no.	134
Start Date	2020-10-21
Start Time	10:00
End date	2020-11-26
Effort (trap more than 1 night)	36
Address-site	3 Evans Lookout Road Blackheath, NSW 2785

Mammalia, Long-nosed Bandicoot ; Perameles nasuta, 2021-01-07, 14:57

Date captured	2021-01-07
Time	14:57
Species (use search box)	Mammalia, Long-nosed Bandicoot ; Perameles nasuta
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Mammalia, Bush Rat ; Rattus fuscipes, 2021-01-07, 14:58

Date captured	2021-01-07
Time	14:58
Species (use search box)	Mammalia, Bush Rat ; Rattus fuscipes
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, Satin Bowerbird ; Ptilonorhynchus violaceus, 2021-01-07, 14:58

Date captured	2021-01-07
Time	14:58
Species (use search box)	Aves, Satin Bowerbird ; Ptilonorhynchus violaceus

No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, Red Wattlebird ; Anthochaera carunculata, 2021-01-07, 14:58

Date captured	2021-01-07
Time	14:58
Species (use search box)	Aves, Red Wattlebird ; Anthochaera carunculata
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, Australian Magpie ; Cracticus tibicen, 2021-01-07, 14:58

Date captured	2021-01-07
Time	14:58
Species (use search box)	Aves, Australian Magpie ; Cracticus tibicen
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Aves, White-browed Scrubwren ; Sericornis frontalis, 2021-01-07, 14:58

Date captured	2021-01-07
Time	14:58
Species (use search box)	Aves, White-browed Scrubwren ; Sericornis frontalis
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Mammalia, House Mouse ; Mus musculus, 2021-01-07, 14:59

Date captured	2021-01-07
Time	14:59
Species (use search box)	Mammalia, House Mouse ; Mus musculus
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

Reptilia, Dark-flecked Garden Sunskink ; Lampropholis delicata, 2021-01-07, 14:59

Date captured	2021-01-07
Time	14:59
Species (use search box)	Reptilia, Dark-flecked Garden Sunskink ; Lampropholis delicata
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2MV short tunnel entrance

6171, SH03, Incidental observations, 2021-06-16, 09:38

Created	2021-06-16 09:38:15 AEST by Simon Tweed
Updated	2021-06-16 09:39:50 AEST by Simon Tweed
Location	-33.6861317225728, 150.287948092208

Site details

Project number	6171
Project name	GWHE
Observers	Kayla Asplet
Site name or no.	SH03
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-16
Start Time	09:38
End Time	09:38
Effort (non-trap)	24
Address-site	27 Foy Avenue Medlow Bath, NSW 2780

Aves, Little Wattlebird ; Anthochaera chrysoptera, 2021-06-16, 09:38

Date captured	2021-06-16
Time	09:38
Species (use search box)	Aves, Little Wattlebird ; Anthochaera chrysoptera
No of individuals (if>1)	1
Obs Type	Observed
ID certain	Yes

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	SH03

Aves, Eastern Yellow Robin ; Eopsaltria australis, 2021-06-16, 09:38

Date captured	2021-06-16
Time	09:38
Species (use search box)	Aves, Eastern Yellow Robin ; Eopsaltria australis
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	SH03

Aves, Lewin's Honeyeater ; Meliphaga lewinii, 2021-06-16, 09:38

Date captured	2021-06-16
Time	09:38
Species (use search box)	Aves, Lewin's Honeyeater ; Meliphaga lewinii

No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	SH03

Aves, Striated Thornbill ; Acanthiza lineata, 2021-06-16, 09:39

Date captured	2021-06-16
Time	09:39
Species (use search box)	Aves, Striated Thornbill ; Acanthiza lineata
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	SH03

Mammalia, Swamp Wallaby ; Wallabia bicolor, 2021-06-16, 09:39

Date captured	2021-06-16
Time	09:39
Species (use search box)	Mammalia, Swamp Wallaby ; Wallabia bicolor
No of individuals (if>1)	1
Obs Type	Observed

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	SH03

6171, Mb2bh, Incidental observations, 2021-06-19, 11:36

Created	2021-06-19 11:36:47 AEST by Simon Tweed
Updated	2021-06-19 11:37:12 AEST by Simon Tweed
Location	-33.6540993046824, 150.283719493812

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Mb2bh
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	11:36
End Time	11:37
Effort (non-trap)	0.0166666666666667
Address-site	B4 Realton Creek Trail Blackheath, NSW 2785

Mammalia, Swamp Wallaby ; Wallabia bicolor, 2021-06-19, 11:36

Date captured	2021-06-19
Time	11:36
Species (use search box)	Mammalia, Swamp Wallaby ; Wallabia bicolor
No of individuals (if>1)	1
Obs Type	Scat

Auto fields

Project no (dup auto)	6171

6171, Pulpit Hill, Incidental observations, 2021-06-19, 10:13

Created	2021-06-19 10:13:36 AEST by Simon Tweed
Updated	2021-06-19 10:17:00 AEST by Simon Tweed
Location	-33.7011497209144, 150.289658423927

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Pulpit Hill
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-19
Start Time	10:13
End Time	10:13
Effort (non-trap)	24
Address-site	Great Western Highway Katoomba, NSW 2780

Aves, Striated Pardalote ; Pardalotus striatus, 2021-06-19, 10:13

Date captured	2021-06-19
Time	10:13
Species (use search box)	Aves, Striated Pardalote ; Pardalotus striatus
No of individuals (if>1)	1
Obs Type	Observed and Heard call
ID certain	Yes

Auto fields

Project no (dup auto)	6171

Aves, Eastern Yellow Robin ; Eopsaltria australis, 2021-06-19, 10:15

Date captured	2021-06-19
Time	10:15
Species (use search box)	Aves, Eastern Yellow Robin ; Eopsaltria australis
No of individuals (if>1)	1
Obs Type	Observed and Heard call

Auto fields

Project no (dup auto)	6171

Aves, Brown Thornbill ; Acanthiza pusilla, 2021-06-19, 10:16

Date captured	2021-06-19
Time	10:16
Species (use search box)	Aves, Brown Thornbill ; Acanthiza pusilla
No of individuals (if>1)	1
Obs Type	Observed and Heard call

Auto fields

Project no (dup auto)	6171
Site name or no (dup auto)	Pulpit Hill

6229, BH2LH - long tunnel entrance, Remote camera, 2020-10-20, 17:25

Created	2020-10-20 17:25:26 AEDT by Simon Tweed
Updated	2020-12-02 11:54:10 AEDT by Simon Tweed
Location	-33.6451093183558, 150.28549067735

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith, Kayla Asplet
Site name or no.	BH2LH - long tunnel entrance
Survey Type	Remote camera
accuracy	undefined
Trap/cam (more than 1 day)	Yes
Trap no.	141
Start Date	2020-10-20
Start Time	17:25
End date	2020-11-24
Effort (trap more than 1 night)	35
Habitat notes	Terrestrial cam - sweet bait and tuna
Photo site	

Address-site	1-27 Hargraves Street Blackheath, NSW 2785

Aves, Australian Magpie ; Cracticus tibicen, 2021-01-07, 14:47

Date captured	2021-01-07
Time	14:47
Species (use search box)	Aves, Australian Magpie ; Cracticus tibicen
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH - long tunnel entrance

Reptilia, Eastern Blue-tongue ; Tiliqua scincoides, 2021-01-07, 14:47

Date captured	2021-01-07
Time	14:47
Species (use search box)	Reptilia, Eastern Blue-tongue ; Tiliqua scincoides
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH - long tunnel entrance

Mammalia, Common Brushtail Possum ; Trichosurus vulpecula, 2021-01-07, 14:47

Date captured	2021-01-07
Time	14:47
Species (use search box)	Mammalia, Common Brushtail Possum ; Trichosurus vulpecula
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH - long tunnel entrance

Mammalia, Bush Rat ; Rattus fuscipes, 2021-01-07, 14:47

Date captured	2021-01-07
Time	14:47
Species (use search box)	Mammalia, Bush Rat ; Rattus fuscipes
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH - long tunnel entrance

Aves, Red Wattlebird ; Anthochaera carunculata, 2021-01-07, 14:48

Date captured	2021-01-07
Time	14:48
Species (use search box)	Aves, Red Wattlebird ; Anthochaera carunculata
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH - long tunnel entrance

Aves, Little Wattlebird ; Anthochaera chrysoptera, 2021-01-07, 14:48

Date captured	2021-01-07
Time	14:48
Species (use search box)	Aves, Little Wattlebird ; Anthochaera chrysoptera
No of individuals (if>1)	1
Obs Type	Acoustic recording

Auto fields

Project no (dup auto)	6229
Site name or no (dup auto)	BH2LH - long tunnel entrance

6171, MB2BH , Incidental observations, 2021-06-20, 10:53

Created	2021-06-20 10:53:31 AEST by Simon Tweed
Updated	2021-06-20 10:54:25 AEST by Simon Tweed
Location	-33.6539653446313, 150.282962915252

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	MB2BH
Survey Type	Incidental observations
Trap/cam (more than 1 day)	No
no. of observers	1
Start Date	2021-06-20
Start Time	10:53
End Time	10:54
Effort (non-trap)	0.0166666666666667
Address-site	B4 Realton Creek Trail Blackheath, NSW 2785

Mammalia, unidentified Bandicoot ; Isoodon/Perameles sp., 2021-06-20, 10:53

Date captured	2021-06-20
Time	10:53
Species (use search box)	Mammalia, unidentified Bandicoot ; Isoodon/Perameles sp.
No of individuals (if>1)	1
Obs Type	Tracks, scratchings
ID certain	No

Photos

Auto fields

Project no (dup auto)	6171

6171, K2MB-1spot1, Spotlighting, 2021-06-16, 17:13

Created	2021-06-16 17:13:37 AEST by Simon Tweed
Updated	2021-06-16 20:55:13 AEST by Simon Tweed
Location	-33.7062991744159, 150.294790305197

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	K2MB-1spot1
Survey Type	Spotlighting
accuracy	undefined
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-16
Start Time	17:13
End Time	18:14
Effort (non-trap)	2.033333333333333
Habitat notes	From roadside towards K2MB-1. 5 degrees, no wind, clear skies, crescent moon. high car traffic at the time of the survey, noise and light pollution being emitted from roadside. Light rain at 6pm. No fauna recorded on the first night.
Photo site	
Address-site	Great Western Highway Katoomba, NSW 2780

6229, BH2MV short tunnel entrance, Echolocation recording, 2020-10-21, 09:15

Created	2020-10-21 09:15:31 AEDT by Simon Tweed
Updated	2021-01-07 14:56:21 AEDT by Simon Tweed
Location	-33.6518211934919, 150.285092874864

Site details

Project number	6229
Project name	GWH
Observers	Amanda Griffith
Site name or no.	BH2MV short tunnel entrance
Survey Type	Echolocation recording
Trap/cam (more than 1 day)	Yes
Trap no.	3855
Start Date	2020-10-21
Start Time	09:15
End date	2020-11-06
Effort (trap more than 1 night)	16
Habitat notes	Deployed on tree - bernview unit
Photo site	

Address-site	Blackheath, NSW 2785

6171, Mb2bh, Spotlighting, 2021-06-19, 19:37

Created	2021-06-19 19:37:49 AEST by Simon Tweed
Updated	2021-06-19 21:14:39 AEST by Simon Tweed
Location	-33.6563212096743, 150.280701618191

Site details

Project number	6171
Project name	GWHE
Observers	Sarah Hart, Kayla Asplet
Site name or no.	Mb2bh
Survey Type	Spotlighting
Trap/cam (more than 1 day)	No
no. of observers	2
Start Date	2021-06-19
Start Time	19:37
End Time	21:14
Effort (non-trap)	3.23333333333333
Address-site	B4 Realton Creek Trail Blackheath, NSW 2785

Annexure D

BC Act Tests of Significance assessments

Blue Mountains Swamps in the Sydney Basin Bioregion

Blue Mountains Swamps in the Sydney Basin Bioregion (Vulnerable BC Act, Endangered EPBC Act)	
Description The Blue Mountains Swamps community is characterised by a dense mixture of shrubs and sedges, most of which have sclerophyllous foliage. The shrub stratum typically varies from 0.5 m to over 2.0 m tall and is highly variable in cover. The ground stratum may be up to about 1 m tall and is dominated by a dense sward of sclerophyllous sedges and grasses except in patches where these are displaced by a dense cover of taller shrubs. Ferns, forbs and small shrubs are scattered amongst the sedges and grasses. There is considerable local variation within the swamps in species composition and vegetation structure, which is apparently related to local soil properties and fire history. Structure of the vegetation varies from closed heath or scrub to open heath to closed sedgeland or fernland. ***Distribution*** The Blue Mountains Swamps community has been recorded in the local government areas of Blue Mountains and Wollondilly within the Sydney Basin Bioregion and may occur elsewhere in the Bioregion. The Blue Mountains Swamps community has a total extent of occurrence of less than 2,000 km^2, bounded approximately by the western Blue Mountains escarpment from Bell to Narrow Neck Peninsula, south to Lacys Tableland, the Hawkesbury-Nepean River from Lapstone to Kurrajong in the east, and Mt Wilson in the north. ***Presence within the REF proposal area*** A patch of Blue Mountains Swamp (swamp) occurs to the west of the existing highway in the south of the REF proposal area to the north of Pulpit Hill. It was confirmed to be at least 1.16 ha in size, likely extending even further to the west along the drainage line. About 0.71 ha occurs within the study area and is located immediately adjacent to the west of the REF proposal area. The REF proposal area in this location includes the area required for construction and placement of the bridge piers as well as a vehicle access track. The patch of swamp is located beneath the proposed bridge near Pulpit Hill. During the design process, one of the sets of bridge piers was located within the eastern-most extent of the swamp. In order to avoid direct impacts to the swamp, the bridge design was amended such that the eastern-most extent of the swamp would fall in the middle of the span between two piers, to maximise the distance between the swamp and the bridge piers. As such, the bridge piers (and access track for construction works) will avoid directly impacting on the swamp. There will be a buffer area of at least 5 m between the construction area for the pier and the margin of the swamp. The piers will be excavated and constructed from the ground, but the bridge deck will be pushed across the valley from south to north across the piers. Two water detention basins will be located upslope, to the north-east and south-east of the swamp to collect water run-off from the bridge deck at either end of the bridge. The basins comprise a two-stage water processing system, designed to maximise quality of water to be discharged into surrounding environment. Any water release would occur over a large area as sheet flow across the hillslope to avoid the potential for erosion and sedimentation in sensitive receiving environments. Assuming an indirect impact area of 50 m from the edge of construction works, taking into account the 5 m buffer, indirect impacts may occur within 45 m of the edge of the Swamp. As such, about 0.12 ha of swamp habitat may be indirectly impacted by the proposal. Impacts to the swamp will be managed and mitigated via implementation of a range of targeted actions (such as protective and sediment fencing around the perimeter of the swamp during construction). Excavation for the bridge piers upslope of the Swamp may also have impacts to underground hydrology on which the Swamps may depend. It is proposed that regular monitoring of the Swamp (to identify and remediate any impacts) also be conducted during construction and into operation and included in the Flora and Fauna Management Plan for the proposal. No Blue Mountains Swamp TEC occurs within the revised proposal area.	
Assessment of significance: An action is likely to have a significant impact on a threatened ecological community (TEC) if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
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	N/A

Blue Mountains Swamps in the Sydney Basin Bioregion (Vulnerable BC Act, Endangered EPBC Act)	
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 *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,	None of the Blue Mountains Swamp adjacent to the REF proposal area will be directly impacted. About 0.12 ha may be subject to indirect impacts. The proposal is unlikely to have an adverse effect on the extent or composition of the TEC such that its local occurrence is placed at risk of extinction as: • No areas of TEC will be removed or directly impacted as a result of the proposal. • There will be a buffer area of at least 5 m between the contrition area and the margin of the swamp. • Indirect impacts to 0.12 ha to the swamp will be managed and mitigated via implementation of a range of targeted actions (such as protective and sediment fencing around the perimeter of the swamp during construction, implementation of the two-stage water processing system and regular monitoring). • The potential impact of increased shading (from the bridge) would occur on the eastern margin of the swamp only (if at all) and be temporal in nature (the area in shadow will likely shift with the sun during the day) such that no one area would be completely and permanently in shadow. The swamp also extends substantially further to the west and would remain unaffected by shadow.
c) in relation to the habitat of a threatened species or ecological community: *i)* the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and *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 *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,	**Extent of impact on habitat:** The proposal will not directly impact any swamp TEC. The swamp is located adjacent to and downgradient of the existing Great Western Highway Road corridor and is therefore likely to already be subject to indirect impacts/edge effects from current operation of the road. Indirect impacts as a result of the proposal may be expected to extend 50 m from the construction footprint. As such, the proposal has the potential to modify 0.12 ha from 1.16 ha within the patch. Indirect impacts to the swamp will be managed and mitigated via implementation of a range of targeted actions (such as protective and sediment fencing around the perimeter of the swamp during construction). It is proposed that regular monitoring of the Swamp (to identify and remediate any impacts) also be conducted during construction and into operation and included in the Flora and Fauna Management Plan for the proposal **Habitat fragmentation:** The proposal is unlikely to fragment or isolate the TEC as the REF proposal area is located to the east of the swamp margin. Indirect impacts have the potential to occur on the eastern-most margin of the swamp, however these impacts would not further fragment or isolate the area of TEC present. Direct and indirect impacts to the extent of swamp within the REF proposal area have been avoided through consultation and design refinement and the implementation of a range of targeted mitigation actions (such as protective and sediment fencing around the perimeter of the swamp during construction). **Importance of habitat to be impacted:** No direct impacts to the TEC are likely to occur within the REF proposal area. The area of Blue Mountains Upland Swamp was inundated in sections at the time of the assessment, and consisted of dense shrub, sedges and ferns towards the south-west portion of the patch with peaty/humic soils. The habitat was considered to provide marginal to moderate quality habitat for the Giant Dragonfly and Blue Mountains Water Skink, two threatened species that are dependent on swamp habitat. The TEC located adjacent to the REF proposal area is at least 1.16 ha in size. The Swamp was observed to continue along the drainage to the west of the proposal towards the escarpment.
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),	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.
e) whether the proposed development or activity is or is part of a key threatening	KTPs listed under the BC Act relevant for this TEC includes: • Clearing and development of land through urbanisation resulting in loss of habitat and/or habitat degradation such as reduced water

Blue Mountains Swamps in the Sydney Basin Bioregion (Vulnerable BC Act, Endangered EPBC Act)	
process or is likely to increase the impact of a key threatening process.	quality, erosion, sedimentation, nutrient enrichment and weed invasion. • Increased sedimentation caused by construction, maintenance, and lack of maintenance of unsealed roads and tracks. • Increased stormwater run-off and reduced water quality from impermeable road surfaces entering swamp headwaters leading to erosion and habitat degradation. The proposed development (through design refinement and the implementation of a range of targeted mitigation actions) is unlikely to contribute to KTPs for the TEC.
Conclusion: In light of criteria a-e, the Proposal will not result in any direct impacts to Blue Mountains Swamp TEC. Potential direct impacts have been avoided through consultation and design refinement. Potential indirect impacts will be managed through implementation of a range of targeted mitigation actions (such as protective and sediment fencing around the perimeter of the swamp during construction and regular monitoring). As such, significant Impacts to this TEC are considered unlikely.	

Needle Geebung

Needle Geebung *Persoonia acerosa* (Vulnerable BC Act and EPBC Act)	
Description Needle Geebung is a small, erect to spreading shrub 1 - 2 m tall. Its bright green, pine-like foliage is very distinctive. The small, needle-like leaves are channelled on the upper surface. Flower clusters are produced along leafy shoots, not at the branch tips, as in related species. The yellow tubular flowers are up to 1 cm long and most frequently appear in summer. Fruits are pear-shaped, yellowish green with brownish-red markings, to 14 mm long and 10 mm in diameter (TBDC 2021). Needle Geebung occurs in dry sclerophyll forest, scrubby low-woodland, and heath on low fertility soils. The species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides (OEH 2019). ***Distribution*** Needle Geebung is listed as vulnerable under the BC Act and EPBC Act. Needle Geebung have been recorded only on the Central Coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. It mainly occurs in the Katoomba/ Wentworth Falls/ Springwood area. ***Presence within the REF proposal area*** The BioNet Atlas has 250 records of the species within the locality (10 km radius). One individual was recorded in the southern portion of the REF proposal area . The area where the individual was located was thoroughly searched to identify any additional individuals which may belong to the population. Parallel searches coupled with radius searches (up to 100 metres; considering bee pollinating distances) were undertaken within this area. The survey did not identify additional individuals, only a non-threatened relative; *Persoonia chamaepitys* Mountain Geebung. Pollination is by native plaster bees (*Leioproctus* spp.) and reed bees (*Exoneura* spp.). No Needle Geebung individuals were identified within the revised proposal area.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
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 proposal is being undertaken along and adjacent to the existing road corridor. One Needle Geebung individual was identified in the southern extent of the REF proposal area near Nellies Glen Road, within moderate condition PCT 1248. A thorough search of the entire study area has been undertaken to identify additional individuals. No other individuals were identified within the study area. The closest records of the species include three individuals located 2 km to the south-west of the study area in the Megalong Valley. The individual within the study area is likely to represent a separate subpopulation to those in the Megalong Valley due to geographical/topographical separation of the individuals and limitation of cross-pollinating opportunities by bees. Other records within 3 km of the species to the south and east, and of similar altitude, may constitute the same population, dependant on the pollination requirements of the species. However, as per the threatened species Test of

Needle Geebung *Persoonia acerosa* (Vulnerable BC Act and EPBC Act)	
	Significance guidelines (OEH 2018c), the local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. Given only one individual was located within the study area (and the surrounding area up to 100 m from the individual was surveyed), the local population is considered to consist of 1 individual. Bonnie Doon Reserve is located adjacent and to the south-east of the species location. There are no current records for the species in this area. However, this area supports the same habitat as recorded within the REF proposal area. It therefore presents potential habitat for the species in close proximity to the recorded specimen. The individual occurs directly within the proposed road alignment and will be directly impacted by the proposal. Therefore, the proposed works are likely to adversely affect the lifecycle of the species such that a local population may be placed at risk of 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 *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,	n/a
c) in relation to the habitat of a threatened species or ecological community: *i)* the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and *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 *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,	**Extent of impact on habitat:** Only one individual was recorded within the study area. The habitat in which it is located will be removed as a result of the proposal. **Habitat fragmentation:** The proposal will remove a small population (one individual). There are no known areas of occupied habitat within 100 m of the recorded individual, or anywhere else in the REF proposal area. As such, the proposal will not fragment an existing population or isolate individuals from a larger/broader population. **Importance of habitat to be impacted:** The habitat in the locality of the one Needle Geebung plant is considered important for the survival of the population at that location. The local population supports only one individual. There are at least 250 records of the species within the locality. The species is known from the Blue Mountains National Park, one historical record from Kanangra-Boyd National Park and areas managed by Blue Mountains City Council at Woodford Dam, a reserve at Leura, Adelina Falls at Lawson, and Hassans Walls Reserve at Lithgow. Some sites are known to support many individuals (up to 40 plants over a few hundred metres in some locations). Given the known records of 250 individuals within the locality, the presence of populations supporting many individuals and the location of known populations within protected reserves, it is considered that the habitat within the REF proposal area is of relatively low importance to the long-term survival of the species in the locality.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.

Needle Geebung *Persoonia acerosa* (Vulnerable BC Act and EPBC Act)	
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.	KTPs listed under the BC Act relevant for this species includes: • Loss of habitat through clearing for urban and small-rural-lot development The one identified *Persoonia acerosa* plant occurs directly within the proposed road alignment and will be directly impacted. It is unlikely that direct impacts to the individual will be avoidable and therefore is likely to contribute to KTPs in the locality.
Conclusion: The proposal will result in the removal of one individual representing a small local population. This population is considered unlikely to be important to the long-term survival of the species. As such, significant Impacts to the species are considered unlikely. Collection of seed for revegetation works will be conducted in an effort to mitigate impacts to the species and allow for re-establishment within the vicinity of the study area.	

Eastern Pygmy-possum

Eastern Pygmy-possum (*Cercartetus nanus*) (Vulnerable BC Act)

Eastern Pygmy-possum

Distribution: The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes (DPIE 2022).

The BioNet Atlas has 32 records within the locality (10 km radius). The species has previously been recorded in low numbers (32 records from the locality in the last 20 years) within the broader Blue Mountains National Park and outside the Study Area to the southwest of Katoomba and the northeast, towards Grand Canyon. Numerous records are present within Newnes State Forest about 8 km to the north of the REF proposal area. The other records are generally near the existing road and urban areas, the closest being in habitat contiguous with and within 500 m of the REF proposal area. All the other records are located at least one km away from the REF proposal area.

Targeted surveys in December 2021 (45 baited camera traps totalling 1,657 trap nights), identified the presence of Eastern Pygmy-possum at seven (7) of 45 remote camera trap locations (15 %) throughout the REF proposal area. These records were located on both sides of the existing highway, and relatively uniformly distributed along the length of the REF proposal area; four locations on the western side of the highway within the southern section (Katoomba to Medlow Bath) of the proposal and three locations on the eastern side of the highway within the northern section of the REF proposal area (Medlow Bath to Blackheath section).

The presence and distribution of Eastern Pygmy-possum individuals within the revised proposal area is unknown due to limited survey effort. Given that habitats within the revised proposal area are contiguous with suitable habitats and where the species is known to occur in the REF proposal area, it is likely that individuals occupy this revised area.

Life cycle, habitat: Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest (OEH 2013). Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g., grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 ha and females about 0.35 ha. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings (DPIE 2022).

Impact summary*:*

Targeted surveys recorded the Eastern Pygmy-possum at seven locations within the REF proposal area and the construction footprint (as described above). It is likely that the species use these areas for foraging, breeding and movement within its home range.

The proposal will result in the potential loss of individuals via construction impacts and require the removal of up to 50.01 ha of native vegetation (confirmed habitat for this species) within the REF proposal area, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. It will also

Eastern Pygmy-possum (*Cercartetus nanus*) (Vulnerable BC Act)	
require the removal of up to 220 hollow-bearing trees (potential nesting/breeding resources). Recommended mitigation measures that are relevant to this species include: • Minimise vegetation clearing/impact footprint wherever possible • Develop Flora and Fauna Management Plan (FFMP), which will include a survey and monitoring program for Eastern Pygmy-possum • Conduct pre-clearing surveys of hollow-bearing trees to identify any breeding/nesting individuals and only undertake clearing once young have left • Installation of suitable compensatory habitat (next boxes) prior to clearing • Avoid clearing of potentially suitable nest trees and retention of fallen timber wherever possible (particularly in areas where the species has been identified [figure 2-2]) • The use of a spotter/catcher to capture and relocate Eastern Pygmy-possums during clearing operations to maintain a level of individual welfare during the removal of potential den sites (hollow-bearing trees, fallen logs, rock crevices, etc.) Part of the mitigation strategy proposed for the project (FFMP) involves the recovery and redeployment of tree hollows and fallen logs and the installation of nest boxes in adjacent habitats. Eastern Pygmy-possums displaced by clearing will be released into these (re)installed structures • Timing of clearing is to avoid breeding season and peak preferred banksia flowering times (late spring to early autumn) • Pre- and post-construction monitoring in an adaptive management framework should be undertaken to identify residual project impacts. Strategies would be developed to ameliorate these impacts.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
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	*Local population* The Eastern Pygmy-possum was recorded at seven different locations, either side of the existing highway during the current surveys. The records were relatively uniformly distributed along the length of the REF proposal area, on both sides of the existing highway, being four locations on the western side of the highway within the southern section (Katoomba to Medlow Bath) of the Study Area and three locations on the eastern side of the highway within the northern section of Study Area (Medlow Bath to Blackheath section). At each location, images of Eastern Pygmy-possums were recorded on multiple occasions i.e. there were multiple visits and/or individuals at the sites, which may indicate presence of greater than one individual at each site. Also, based on the relatively small home range size of the species [0.7 to 0.4 ha], the records were sufficiently far apart (about 400 m) to suggest they were different individuals at each location (the exception being the two northern-most records which were only about 100 m apart). It is noted that Eastern Pygmy-possums have been recorded moving distances of up to 500 m (Law et al 2013), however, this observation may have been in response to disturbance, and overall, their home ranges have been recorded in the order of 0.04-1.73 ha [Dickman *et al* 2006, Dickman et al 2002, Ward 1990, Harris 28, Laidlaw and Wilson 1996, Maloney *et al* 2007) .As such, it must be assumed that each record represents the presence of at least one individual, with the potential for others to be present at each location. As detailed above, the Eastern Pygmy-possum has previously been recorded in low numbers (32 records from the locality in the last 20 years) within the broader Blue Mountains National Park and outside the Study Area to the southwest of Katoomba and the northeast, towards Grand Canyon. One record is located within contiguous habitat within 500 m of the Study Area; the remainder of the records are at least one km from the Study Area. Based on the maximal movement distance recorded for the species (400-500 m Law et al 2013) the record within 500 m of the Study Area may represent an individual from the same population as recorded in the south-western side of the existing highway. The remainder of the records are located numerous kilometres away from the Study Area and thus are not likely to be part of the 'local population'.

Eastern Pygmy-possum (*Cercartetus nanus*) (Vulnerable BC Act)	
	With respect to the local population (individuals within the Study Area and/or contiguous habitat that may use the Study Area, OEH 2018), it is considered likely that the presence of the existing road and railway line acts as a significant barrier to movement of the species from habitat on the eastern and western sides of the road. As such, the records from the Study Area are considered likely to potentially represent two distinct populations, as follows: • **North-east population:** consisting of at least three individuals occupying an area bounded by the Great Western Highway to the west, Medlow Bath township to the south and Evans Lookout Road to the north and occupies the eastern area of the Blue Mountains National Park. • **South-west population:** consisting of at least four individuals occupying an area bounded by the Great Western Highway to the east, Foy Avenue to the north, Katoomba township to the south-east, and occupies the south and western area of the Blue Mountains National Park. Given the presence of vast areas of similarly suitable contiguous habitat (> 1000 ha), it is likely that the surrounding habitat on each side of the highway also supports more individuals of the species. According to DPIE (*pers. comm.* Kylie Madden, DPIE, 2021), Eastern Pygmy-possum populations within the Blue Mountains area tend to be widespread, but individuals occur in low numbers. Thus, it is likely that the local populations may be larger/more extensive, but there is no information/data to support this at this time. *Life-cycle* Given the relatively small home range of the species (about 1 ha), individuals recorded within the REF proposal area are likely using the areas within the REF proposal area for all aspects of their life-cycle including foraging, breeding and movement/dispersal, as described below: • **Foraging:** Eastern Pygmy-possums forage on forest trees and shrubs including *Acacia* sp., *Banksia* sp., Eucalypts and other nectar/pollen providing vegetation. Foraging resources present within the REF proposal area that have been documented as being particularly important for this species include *Banksia serrata* and *Banksia ericifolia*, followed by less preferred *Banksia marginata* and *Banksia spinulosa* (Harris 2010; Rueegger 2011, and Goldingay unpublished data). These resources are widely available in the low to moderate condition vegetation that is to be impacted by the proposal. • **Breeding/nesting:** The REF proposal area, revised proposal area and broader study area contains 231 hollow-bearing trees recorded on-site, thickets of vegetation, dead trees and fallen woody debris, that Eastern Pygmy-possum is known to shelter in (Law *et al.* 2018). Hollows specifically are critical habitat for nesting. Up to 207 hollow-bearing trees that occur in the REF proposal area, will be directly impacted. • **Dispersal (movement):** The large intact patches of Blue Mountains National Park (for both populations; north-east and south-west) are adjacent to either side of the REF proposal area provide extensive areas of habitat facilitating fauna movement throughout the region. The proposal would remove up to 50.01 ha of known habitat for the Eastern Pygmy-possum. While extensive areas of suitable habitat exists beyond the REF proposal area, given their relatively small home ranges, the area to be impacted by the proposal (the REF proposal area) is considered likely to be important for all stages of the species' life cycle. *Impact* Given their relatively small home ranges, the removal of 50.01 ha of known habitat is likely to displace numerous individuals (at least 7) and

Eastern Pygmy-possum (*Cercartetus nanus*) (Vulnerable BC Act)	
	will result in impacts on the life cycle of the species through the removal of foraging and nesting resources. This is further supported by Bladon *et al.* 2002, who commenced research on the Eastern Pygmy-possum in a site near Dorrigo (northern NSW) in 1990, the site was then unexpectedly and extensively cleared and burnt in 1992. The study observed a 23% long-term reduction in the number of Eastern Pygmy-possum captures post vegetation clearing. In Stawski and Simmonds 2021, physiological and behavioural adaptions were observed in Eastern Pygmy-possum individuals, in response to changes in climate and reduced habitat. Individuals employed more torpor to build up fat reserves in anticipation of leaner times and to preserve longevity. These survival-based adaptions are likely to have flow-on implications. The results of these studies provide strong evidence that the long-term survival of Eastern Pygmy-possum populations are threatened by continued land clearing throughout much of their present range. Implementation of key mitigation measures (as listed above) will assist in avoiding/mitigating impacts to the Eastern Pygmy-possum (especially breeding habitat). ***Summary*** The area of Eastern Pygmy-possum habitat to be removed as part of the proposal is considered likely to be important for all stages of the species' life cycle for the relatively small number of individuals known to be a part of the local population. In lieu of any data regarding the presence of additional individuals beyond the Study Area (and thus evidence of the presence of a larger/more extensive population), the proposal is considered likely to have a direct impact on Eastern Pygmy-possum habitat, such that the viable local populations may be placed at risk of extinction. An Eastern Pygmy-possum survey and monitoring program is to be developed to better understand the extent of the population and determine whether there are additional individuals beyond the Study Area. The monitoring program will include the installation of nest boxes in areas outside the REF proposal area, which will also potentially provide suitable supplementary nesting habitat. The findings of the program will determine whether the proposal will have a significant impact on the local population(s).
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 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,	N/A
c) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	**The extent of the impact on habitat:** Up to 50.01 ha of foraging, breeding, dispersal and nesting habitat are likely to be impacted by the proposed actions. These vegetation zones are mostly low to moderate condition and are already disturbed by previous clearing activity. The proposed area will remove up to 220 hollow-bearing trees which further impact nesting habitat. The habitat is considered important for all stages of the species' life cycle.

Eastern Pygmy-possum (*Cercartetus nanus*) (Vulnerable BC Act)	
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 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,	**Fragmentation of habitat:** The foraging, breeding, dispersal and nesting habitat being cleared will fragment other areas of habitat as it will be cleared adjacent to the existing highway. The distance separating the areas of native vegetation on the eastern and western sides of the existing highway is variable along its length, however, is currently an average width of about 20 to 30 metres. The proposal would result in an increase in the distance between the two areas to about 100 metres. Prior to surveys (Niche 2021/2022), the distribution of Eastern Pygmy-possum records was thought to be restricted to the south and east of the southern portion of the REF proposal area. However, targeted surveys recorded the Eastern Pygmy-possum in multiple locations across the REF proposal area. The distribution of the sightings within the REF proposal area was widespread, and on both sides of the road alignment (detected at 15% of remote camera locations). Although it is unknown whether the Eastern Pygmy-possum currently crosses the existing highway, the proposal will result in further habitat fragmentation. Habitat fragmentation may inhibit individual movement, resulting in potential loss of genetic exchange between populations on either side of the existing highway, and cause mortality due to increased risk of vehicle strike. Further, the abundance and distribution of Eastern Pygmy-possum individuals within the revised proposal area is unknown due to limited survey effort. Given that the revised area is connected, and similar to the suitable habitats in the REF proposal area , it is likely that individuals occupy the revised proposal area. As such, the proposal has the potential to further fragment the local population of Eastern Pygmy-possum such that it might be at risk of local extinction, without appropriate mitigation measures. **Importance of habitat to be impacted:** The distribution of the records within the REF proposal area is widespread on both sides of the road alignment (detected at 15% of remote camera locations). Given the extent of potentially suitable habitat adjacent to the Study Area, it is likely that key foraging, shelter and breeding resources are similarly present throughout the broader landscape, and the local population may not only be dependent on the resources within the REF proposal area for survival. However, given the location of the records, and the relatively small home range of the species it is likely the species is using the REF proposal area as part of its core habitat for foraging, breeding and dispersal purposes. In light of the above considerations, the habitat to be removed is considered likely to be important to the species, and the direct removal of foraging, dispersal and nesting habitat present in the REF proposal area, and revised proposal area is considered to have the potential to impact the long-term survival of the local population of Eastern Pygmy-possums as we currently understand it. Further surveys will be conducted in the broader locality as part of a survey and monitoring program to improve on our existing knowledge of the local populations, and better inform management of the species. Further, hollow-bearing trees are a limiting and essential resource, required by these hollow-dependent species for breeding and shelter. Nest boxes will be required to be installed as part of the proposal to provide compensatory shelter/breeding resources for these species potentially affected.
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),	No Areas of Outstanding Biodiversity Value will be impacted directly or indirectly

Eastern Pygmy-possum (*Cercartetus nanus*) (Vulnerable BC Act)	
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.	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation, leading to loss and fragmentation habitat • Loss of hollow bearing trees • Removal of dead wood and dead trees • Predation from cats, dogs, and foxes • Mortality on roads through habitat and movement areas. The project will, or is likely to, result in, or increase, the operation of the above KTPs.
Conclusion: In light of criteria a-e, Eastern Pygmy-possums have been observed in several locations within the REF proposal area, and it is highly likely that the species utilises the area for breeding, foraging, and sheltering. The proposal will result in direct impacts to 50.01 ha of habitat for the Eastern Pygmy-possum, which is considered to have the potential to place the relatively small, local population(s), at risk of extinction. The proposal is likely to increase the operation of a number of KTPs and have a significant impact on the long-term survival of Eastern Pygmy-possum in the locality. Therefore, the preparation of a Species Impact Statement (SIS), or entry into the Biodiversity Offsets Scheme (BOS) and the preparation of a Biodiversity Development Assessment Report (BDAR) is required.	

Large-eared Pied Bat

Large-eared Pied Bat (Vulnerable, BC Act and EPBC Act)	
Distribution: Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. The BioNet Atlas has 11 records within the locality (10 km radius). The species was not recorded within the REF proposal area, nor the broader study area. **Life cycle, habitat:** Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Petrochelidon ariel), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months. **Impact summary:** The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. The vegetation to be removed represents potential foraging habitat for the species.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
a) In the case of a threatened species, whether the action proposed 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 Large-eared Pied Bat was not recorded during targeted acoustic surveys conducted in Spring/summer 2020. The Large-eared Pied Bat is a cave-breeding and roosting species. The REF proposal area and revised proposal area is situated approximately 1 km east of the Megalong Valley Escarpment Area. Large-eared Pied Bat may use higher quality areas (e.g., intact patches of vegetation and corridors) within the REF proposal area and study area for foraging and transient purposes. The south-west and north-east portion of the proposal (either side of the road alignment) is situated within extensive contiguous habitat. The proposal will not require modification of small caves, overhangs, crevices and fissures in escarpment within the REF proposal area or revised proposal area. Caves, overhangs, fissures and crevices in escarpment are also likely to be very common in the region. Breeding cave dwelling species such as Large-eared Pied Bat tend to display fidelity to their breeding sites and maternity caves and are likely to breed in large numbers. Due to the lack of suitable cave

Large-eared Pied Bat (Vulnerable, BC Act and EPBC Act)	
	habitat within the REF proposal area and revised proposal area, the proposal is unlikely to impact on a maternity cave or a large roosting site and thus the proposal is unlikely 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.
b) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: 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 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	Not applicable
c) In relation to the habitat of a threatened species, population or ecological community: i) The **extent** to which habitat is likely to be removed or modified as a result of the action proposed, and ii) Whether an area of habitat is likely to become **fragmented** or isolated from other areas of habitat as a result of the proposed action, and iii) The **importance** of the habitat to be removed, modified, fragmented, or isolated to the long-term survival of the species, population or ecological community in the locality.	**Extent of impact on habitat:** In accordance with the BAM 2020 and 'Species credit' threatened bats and their habitats (DPIE 2018), the proposal will be removing up to 50.01 ha of potential Large-eared Pied Bat foraging habitat. However, as mentioned previously the south-west and north-east portion of the proposal (either side of the road alignment) is situated within extensive contiguous habitat (Blue Mountains National Park). The proposal will not impact any breeding/roosting habitat for the species in the form of karst environments, overhangs, fissures and crevices in the escarpment to east of the REF proposal area. **Habitat fragmentation:** Large-eared Pied Bat are highly mobile species. The proposal may impact a portion of foraging habitat (up to 50.01 ha) of variable quality that extends for 7 km along the linear proposal footprint. The current Highway already fragments/isolates habitat on the eastern and western sides of the highway. The removal of additional vegetation along the edges of the road for the proposal is unlikely to substantially affect a highly mobile species such as the Large-eared Pied Bat especially due to the extensive foraging resources available in the surrounding environment. As such, the proposal is unlikely to further fragment the landscape or isolate habitat such that it would threaten the long-term survival of the species. **Importance of habitat to be impacted:** The proposed works will impact a portion of potential foraging habitat in varying condition for Large-eared Pied Bat within a large contiguous landscape. The species is unlikely to be dependent on the potential foraging habitat with the REF proposal area and revised proposal area for survival.
e) Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.
f) Whether the action proposed constitutes or is part of a Key Threatening Process (KTP) or is likely to result in the operation of, or increase the impact of, a KTP	KTPs listed under the BC Act relevant for this species includes: • Clearing and isolation of forest and woodland habitats near cliffs, caves and old mine workings for agriculture or development. Large-eared Pied Bat are highly mobile species. The proposal may impact a portion of foraging habitat of variable quality that extends for 7 km along the linear proposal footprint, however, the REF proposal area and revised proposal area is not within close proximity to the Megalong Valley Escarpment Area. As such, the proposal is unlikely to contribute to KTPs in the locality.

Large-eared Pied Bat (Vulnerable, BC Act and EPBC Act)
Conclusion: There will be no impacts to Large-eared Pied Bat breeding/roosting habitat as a result of the proposal. The proposal may impact on a relatively small area of potential foraging habitat for the species only. . In light of criteria a-e, the proposal is considered unlikely to have a significant impact on the Large-eared Pied Bat.

Koala

Koala (*Phascolarctos cinereus*) (Vulnerable BC Act and EPBC Act)	
Distribution: The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. The study area is 15 km west of the Blaxland Area of Regional Koala Significance (within traversing range; particularly during breeding season) (DPIE 2020d). The BioNet Atlas has nine records within the locality (10 km radius). Two of those records are located about 9.5 km to the north of the REF proposal area and revised proposal area along the Great Western Highway (from 2004 and 2020), while the remaining six occur to the east in the Blackheath/Leura area (recorded in 2006, 2013 and 2015). No Koalas were observed during targeted surveys. Scats resembling those of the Koala were collected during the surveys. These were confirmed through genetic testing to be those of the Mountain Brushtail Possum (*Trichosurus cunninghami*). **Life cycle, habitat:** Koala inhabit eucalypt woodlands and forests, feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. The Koala is inactive for most of the day, feeding and moving mostly at night, while spending most of their time in trees, but will descend and traverse open ground to move between trees. The home range size varies with quality of habitat, ranging from less than two ha to several hundred ha in size. Koalas are generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year. **Impact summary:** The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodland and forest habitat types located next to the existing Great Western Highway. This represents potential habitat for the Koala. Native vegetation to the north, north-east, west and south-west of the study area is part of a contiguous patch (Blue Mountains National Park and WaterNSW lands). However, portions of the study area have been previously impacted by historical land clearing, agricultural activity and development which has slightly reduced the connectivity.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
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 proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. The study area contains a number of Koala use tree species as listed under the SEPP (Koala Habitat Protection) 2021 for the Central and Southern Tableland's Koala Management Area, including, the dominant Silvertop Ash (*Eucalyptus sieberi*) and Sydney Peppermint (*Eucalyptus piperita*). In addition, for the Central and Southern Tablelands, Ribbon Gum (*Eucalyptus viminalis*; Primary food tree) and Brittle Gum (*Eucalyptus mannifera*; secondary food tree) were identified in low densities in the eastern portion of the proposal footprint (DECC 2008). The native vegetation to be removed likely represents secondary Koala habitat (as per DECC 2008) given the low number of previous records within close proximity and low numbers of primary food trees present. Secondary habitat is defined as "Primary food tree species absent, habitat comprised of secondary and supplementary food tree species only. Capable of supporting viable, low-density populations (< 0.10 koala/ha)" (DECC 2008). BioNet records within the locality indicate that Koalas may use the areas in close vicinity of the study area at least on an occasional basis. It is unlikely, however that the study area supports a breeding population of Koalas (due to lack of foraging resources and Koala records/observations).

Koala (*Phascolarctos cinereus*) (Vulnerable BC Act and EPBC Act)	
	Approximately 849.82 ha of native woody vegetation occurs within the 500 m buffer of the study area. With up to 50.01 ha of native vegetation to be removed the proposal will result in the removal of a relatively small proportion (about 5.6 per cent) of potential habitat present within the immediate area. The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement throughout the region. The increase in distance and barrier may result in reduced ability for terrestrial fauna (Koala) to move safely across the road to access patches of habitat on either side. Given the habitat present in the study area is not likely to support a breeding population or core koala habitat, the study area is unlikely to constitute important habitat for the local population of the species. Therefore, the removal of a relatively small proportion of potential habitat is unlikely to have an adverse effect on the life cycle of the Koala such that a viable local population of the species is likely to be placed at risk of 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 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,	n/a
c) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and 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 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,	**Extent of impact on habitat: Up to** 50.01 ha of potential Koala habitat would be removed as a result of the proposal. **Habitat fragmentation:** The habitat to be removed is located alongside the existing Great Western Highway. Its removal will not result in the isolation of patches of habitat given connectivity of habitat on either side with the Blue Mountains National Park and WaterNSW catchment area. Habitat on either side of the existing highway is already effectively isolated due to presence of the existing highway and railway corridor being a barrier to movement for fauna species. Movement and connectivity in the broader landscape are provided by adjacent vegetation including the larger area of suitable habitat within the Blue Mountains National Park. The increase in road width may result in reduced ability for terrestrial fauna (Koala) to move safely across the road to access patches of habitat on either side. The proposal has the potential to increase the risk of injury or death from trampling during construction or from vehicle strike post-construction. However, given the traffic will remain at similar levels along with the continuation of speed limits and implementation of construction mitigation measures the assessed risk is low. **Importance of habitat to be impacted:** As discussed above, the study area is unlikely to represent important habitat for the long-term survival of the Koala in the locality due to its roadside location, low number of records within the locality and the abundant undisturbed, habitat available in the immediate area.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding	No Areas of Outstanding Biodiversity Value fall within the areas to be cleared or potentially impacted by the Proposal.

Koala (*Phascolarctos cinereus*) (Vulnerable BC Act and EPBC Act)	
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.	KTPs listed under the BC Act relevant for this species include: • Clearing of native vegetation: Up to 50.01 ha of potential Koala habitat would be removed as a result of the Proposal.
Conclusion: It is considered unlikely that a local population of Koala would be significantly impacted by the Proposal considering the following: • The habitat to be impacted is unlikely to represent habitat on which the Koala relies for breeding • Presence and availability of extensive areas of similarly suitable habitat within the locality • Implementation of pre-clearing surveys • Implementation of vehicle strike impact mitigation.	

Grey-headed Flying-fox

Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable BC Act and EPBC Act)	
Distribution: Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. The BioNet Atlas has 72 records within the locality (10 km radius). The Grey-headed Flying-fox was not recorded during current surveys. No roosting/breeding camps were present within the REF proposal area and revised proposal area. **Life cycle, habitat:** Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. The species can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. They feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. They also forage in cultivated gardens and fruit crops. **Impact summary:** The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. This vegetation represents potential foraging habitat for the species.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
i) In the case of a threatened species, whether the action proposed 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	Impacts of the proposal would be restricted to a potential foraging habitat adjacent to the existing highway (up to 50.01 ha). There is no breeding or roosting habitat for the Grey-headed Flying-fox in the study area. The closest know camp site occurs at Emu Plains (approximately 35 km from the study area, National Flying Fox Monitoring viewer http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf. The study area is distant from any roost sites, and it is not expected that mortality from vehicle strike would increase. Given the abundance of potential foraging habitat, and other areas of native vegetation within the locality, the removal of up to 50.01 ha of potential foraging habitat located along the existing highway is considered unlikely to have impacts on important life-cycle stages of this species such that a viable local population of the species would be placed at risk of extinction.
b) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: 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 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	N/A

Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable BC Act and EPBC Act)	
c) In relation to the habitat of a threatened species, population or ecological community: i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	**Extent of impact on habitat:** The proposal would result in the removal of approximately 50.01 ha of native vegetation which may provide foraging habitat for the Grey-headed Flying-fox. Over 849.82 ha of similar habitats (woody vegetation) are mapped within the 500 m buffer of the REF proposal area, therefore the proposal would remove 5.6 per cent of similar habitats in the surrounding area. **Habitat fragmentation:** The proposal is not likely to isolate or fragment any areas of habitat for the Grey-headed Flying-fox. The potential foraging habitat in the study area is already fragmented by the existing highway. The area of vegetation to be impacted by the proposal occur alongside the existing road. Given the high mobility of these species, clearing for the proposed road adjacent to the existing road, would be unlikely increase fragmentation for these species. **Importance of habitat to be impacted:** The habitat to be removed represents typical foraging habitat available within the region. The species is unlikely to be dependent on the resources within the study area for the long-term survival in the locality.
d) Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.
e) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP	The following KTPs relevant to this species are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation. The habitat within the REF proposal area , revised proposal area and broader study area is part of a large contiguous patch (>1000 ha) of high-quality habitat. Therefore, the proposal is unlikely to significantly contribute to KTPs for the species.
Conclusion: The proposal is considered unlikely to have a significant impact on the Grey-headed Flying-fox**.**	

Gang-gang Cockatoo

Gang-gang Cockatoo (*Callocephalon fimbriatum*) (Vulnerable BC Act)	
Distribution: The Gang-gang cockatoo is a medium sized bird with a distribution spanning from southern Victoria to south and central eastern NSW. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. The BioNet Atlas has 54 records within the locality (10 km radius). The species was identified flying above the canopy in the REF proposal area and the revised proposal area during spring 2020 and Summer 2021 surveys. **Life cycle, habitat:** The species prefers different habitat types according to the season. In spring and summer, Gang-gang Cockatoo will inhabit tall mountain forests and woodlands including wet sclerophyll forests. In autumn and winter, the species will move to lower altitudes and occupy open dry sclerophyll forests and woodlands including box-gum and box-ironbark vegetation communities. Gang-gang Cockatoo is known to occasionally inhabit sub-alpine Snow Gum *Eucalyptus pauciflora* woodland in addition to temperate rainforests. Gang-gang Cockatoo preferred breeding habitat occurs in old growth forest and woodlands containing numerous hollows higher than 9 m above ground level and larger than 10 cm in diameter. The Gang-gang Cockatoo nests in hollows in the trunks, limbs or dead spouts of tall living trees, especially Eucalyptus species, often near waterways or waterbodies. **Impact summary:** The proposal will require the removal of up to 50.01 ha of confirmed foraging habitat for Gang-gang Cockatoo.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle	The species was identified flying above the canopy in the REF proposal area and revised proposal area during summer 2021,

Gang-gang Cockatoo (*Callocephalon fimbriatum*) (Vulnerable BC Act)	
of the species such that a viable local population of the species is likely to be placed at risk of extinction	spring 2020 surveys and there are numerous records (54) of the species within the locality. Individuals weren't observed during winter surveys, and this is consistent with behaviour for this species as they usually occupy areas at lower elevations during the cooler months. Given that individuals have already been identified utilising the proposal area during breeding season (summer 2021 and spring 2020), it is likely that there may be breeding habitat within the vicinity of the proposal area. Targeted hollow bearing tree surveys were conducted in summer 2021 to survey for breeding individuals within the 18 potential nest trees in the REF proposal area (however, no suitable nest trees within the revised proposal area). The surveys confirmed the absence of breeding individuals within the REF proposal area. The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. The proposal has the potential to impact the Gang-gang Cockatoo through the reduction of foraging habitat. Habitat present is of variable quality extending 7 km along the linear proposal footprint. Up to 50.01 ha of low to moderate condition forest/woodland will be removed. Foraging habitat is also present with an abundance of feeding resource (mix of eucalypts and acacias) in moderate condition PCT 1248 *Sydney Peppermint - Silvertop Ash heathy open forest on sandstone ridges of the upper Blue Mountains, Sydney Basin Bioregion.* Given the large area of similar habitat available within the broader area, the Blue Mountains National Park and Water NSW land, the removal of foraging habitat adjacent to the existing highway is unlikely to significantly impact on the resources available such that a viable local population may be placed at risk of extinction. Mitigation measures to be employed to avoid/mitigate impacts to the species will include: • Avoid clearing of potentially suitable nest trees wherever possible • Time clearing to avoid breeding season (October to January) • Pre-clearing surveys to identify any breeding/nesting individuals and only undertake clearing once young have fledged. • Installation of suitable next boxes (as per the nest box plan).
b) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: 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 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	n/a
c) In relation to the habitat of a threatened species, population or ecological community:	**Extent of impact on habitat:** The approximate 50.01 ha of native woodland vegetation to be impacted by this proposal is likely to reduce foraging habitat for the species. A range of eucalypt and acacia species (potential foraging habitat of Gang-gang Cockatoo) is

Gang-gang Cockatoo (*Callocephalon fimbriatum*) (Vulnerable BC Act)	
i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	present throughout the study area. Forested habitats occupying the majority of the study area were determined to be moderately to highly connected and mildly disturbed by edge effects and fragmentation. **Habitat fragmentation:** The proposal will not result in fragmentation of habitat for the Gang-gang Cockatoo. It will include the removal of vegetation adjacent to the existing road corridor. No large blocks of high-quality habitat for these species will be fragmented by the proposed modification. The species is highly mobile, occupy a large home range and can persist in areas where small scale disturbances occur. As such, the proposal is unlikely to affect the movement of the species between habitats. **Importance of habitat to be impacted:** The vegetation to be removed within the study area (up to 50.01 ha) would be limited to areas next to the existing highway within the REF proposal area and revised proposal area. The proposal may slightly increase the risk of vehicle/bird interactions and fatalities due to an increase in the volume of traffic; however, the increase is unlikely to be substantial as highway speeds will be similar to current levels. Given the mobility of the species and abundance of continuous habitat in the locality, the Gang-gang Cockatoo are considered unlikely to be dependent on the foraging resources within the REF proposal area for survival.
d) Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.
e) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP	The following KTPs will occur as a result of the proposal: • Clearing of native vegetation • Loss of hollow bearing trees • Removal of dead wood and dead trees.
Conclusion: The proposal is unlikely to have a significant impact on the Gang-gang Cockatoo, provided the proposed measures to avoid/mitigate impacts to potential foraging resources are implemented.	

Spotted-tailed Quoll

Spotted-tailed (*Dasyurus maculatus*) (Vulnerable BC Act, Endangered EPBC Act)	
Distribution: The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. The BioNet Atlas has 190 records within the locality (10 km radius). No quolls were recorded during surveys and camera trapping. No den or latrine sites were recorded within the REF proposal area and revised proposal area. **Life cycle, habitat:** Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath, and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Mostly nocturnal, although will hunt during the day; spend most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. A generalist predator with a preference for medium-sized (500 g-5 kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl. Females occupy home ranges of 200-500 ha, while males occupy very large home ranges from 500 to over 4,000 ha. Are known to traverse their home ranges along densely vegetated creek lines. Average litter size is five; both sexes mature at about one year of age. Life expectancy in the wild is about 3-4 years. **Impact summary:** The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. The vegetation to be removed provides potential habitat for the species. Native vegetation to the north, north-east, west and south-west of the study area is part of a contiguous patch (Blue Mountains National Park and WaterNSW lands). However, portions of the study area have been previously impacted by historical land clearing, agricultural activity and development which has slightly reduced the connectivity.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
a) In the case of a threatened species, whether the action proposed 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 species was not recorded during terrestrial baited camera trapping conducted in spring 2020. Three baited cameras were deployed at three different sites to target terrestrial mammal species including the Eastern Pygmy-possum (*Cercartetus nanus*) and Spotted-tailed Quoll. No latrine or den sites were recorded in the REF proposal area or revised proposal area. However, there are many records for the species in the locality indicating they may occur within the REF proposal area and revised proposal area or use it as part of their home range. The proposal will require the removal of up to 50.01 ha of native vegetation within the REF proposal area and revised proposal area, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. A total of 231 hollow-bearing trees have been recorded within the study area and up to 220 will be directly impacted as they occur within the REF proposal area and revised proposal area, however, not all of these provide suitable den habitat as they would be expected to be utilising smaller hollows, closer to the ground. They are also not exclusively dependant on hollow-bearing trees for den sites. The proposal has the potential to impact the Spotted-tailed Quoll through removal of potential breeding habitat (hollow-bearing trees and fallen logs) and reduction of foraging habitat. Habitat present is of variable quality extending 7 km along the linear proposal footprint and, given their relatively large home ranges (200-500 ha) would represent a relatively small portion of habitat for species whose home ranges may overlap the REF proposal area and/or revised proposal area. Given the large area of similar habitat available within the broader area, the Blue Mountains National Park and Water NSW land, the likely presence of suitable breeding and foraging resources within these areas, species mobility and the removal of a relatively small proportion of woodland habitat within the study area is considered unlikely to have an adverse effect on the life cycle of these species such that viable local populations would be placed at risk of extinction.

Spotted-tailed (*Dasyurus maculatus*) (Vulnerable BC Act, Endangered EPBC Act)	
b) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: 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 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	N/A
c) In relation to the habitat of a threatened species, population or ecological community: i) The extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	**Extent of impact on habitat:** Up to 50.01 ha of native woodland vegetation to be impacted by the proposal is likely to reduce the potential foraging and breeding habitat. Up to a number (220) of hollow-bearing trees and fallen logs (potential den sites) will be impacted. Forested habitats occupying the majority of the study area were determined to be moderately to highly connected and mildly disturbed by edge effects and fragmentation. It is expected that given their relatively large home ranges (200-500 ha), the habitat within the REF proposal area and revised proposal area would represent a relatively small portion of habitat for this species. **Habitat fragmentation:** The habitat to be removed is located alongside the existing Great Western Highway, therefore its removal will not result in the isolation of patches of habitat. Movement and connectivity on either side of the existing highway and railway corridor, is provided by adjacent vegetation including the larger area of suitable habitat within the Blue Mountains National Park. There are 190 records of the species in the locality. Many of these records occur on both side of the current highway, along the plateau adjacent to the REF proposal area and revised proposal area, in the vicinity of Blackheath, Medlow Bath and near the Katoomba end of the proposal, indicating a likely substantial local population. The current highway and rail corridor creates an existing (and long-standing) barrier to terrestrial fauna movement from east to west. The approximate distance between vegetation patches either side of the existing Great Western Highway is approximately 20 to 40 metres. The proposal would result in an increase in the distance between the two areas to a maximum distance of 100 m. In some areas, there are existing obstructions to fauna movement (e.g. rail corridor, fencing and buildings). It is possible that the patches of fauna habitat on the eastern and western side of the highway are already effectively isolated (and have been for some time) due to the existing road, rail line and barriers such as fences. It is likely that resident terrestrial fauna are already habituated to the presence of the road and rail corridor. However, the increase in road width may result in reduced ability for terrestrial fauna to move safely across the road to access patches of habitat on either side. As such, the proposal may increase the risk of vehicle interactions and fatalities. However, given the long-standing presence of the existing road and railway line, it is unlikely to significantly effect habitat fragmentation for the species. It is recommended that fauna mortality monitoring be conducted prior to, during construction and throughout the early years of operation to understand if fauna mortality and fragmentation is an issue and mitigation may be required. **Importance of habitat to be impacted:** Most of the vegetation to be removed within the study area (up to 50.01 ha) would be limited to areas next to the existing highway. The foraging habitat to be removed in this area includes small areas of vegetation next to the existing

Spotted-tailed (*Dasyurus maculatus*) (Vulnerable BC Act, Endangered EPBC Act)	
	highway. No individuals were recorded within the REF proposal area and revised proposal area. As detailed above, given their relatively large home ranges (200-500 ha), it is considered that the habitat within the REF proposal area and revised proposal area would represent a relatively small portion of habitat for species and they would be unlikely to be dependent on the resources within the REF proposal area and revised proposal area for survival.
d) Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.
e) Whether the action proposed constitutes or is part of a KTP or is likely to result in the operation of, or increase the impact of, a KTP	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation • Loss of hollow bearing trees • Removal of dead wood and dead trees.
Conclusion: The proposal is considered unlikely to have a significant impact on the Spotted-tailed Quoll.	

Rosenberg's Goanna

Rosenberg's Goanna (*Varanus rosenbergi*) (Vulnerable BC Act)	
Distribution: Rosenberg's Goanna occurs on Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the Southwest Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia. The Bionet Atlas has no records within the locality (10km radius). **Life cycle, habitat:** Found in heath, open forest, and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Lays up to 14 eggs in a termite mound; the hatchlings dig themselves out of the mounds. **Impact summary*:*** The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. This vegetation represents potential habitat for the species. Native vegetation to the north, north-east, west and south-west of the study area is part of a contiguous patch (Blue Mountains National Park and WaterNSW lands). However, portions of the study area have been previously impacted by historical land clearing, agricultural activity and development which has slightly reduced the connectivity.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
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 species has not been recorded in the REF proposal area and revised proposal area . The proposal will require the removal of up to 50.01 ha of native vegetation, including potential habitat for the Rosenberg's Goanna. The proposal has the potential to impact the Rosenberg's Goanna through the reduction of foraging habitat and potential loss of hollow logs used as shelter. Habitat present is of variable quality extending 7 km along the linear proposal footprint. Individuals require large areas of habitat and thus the potential habitat within the REF proposal area and revised proposal area would likely only represent a small area of habitat within the home range of any individuals that may be likely to occur. Given the large area of similar habitat available within the surrounding area, including the Blue Mountains National Park and Water NSW land, the likely presence of suitable breeding and foraging resources within these areas, species mobility and the removal of a relatively small proportion of woodland habitat within the study area, the proposal is considered unlikely to have an adverse effect on the life cycle of these species such that viable local populations would be placed at risk of extinction.
e) 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 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,	n/a
c) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	**Extent of impact on habitat:** The approximate 50.01 ha of native woodland vegetation to be impacted by the proposal may reduce potential foraging and sheltering habitat for the species. Hollow logs (potential shelter) within the REF proposal area and revised proposal area may be removed. Forested habitats occupying majority of the study area were determined to be moderately to highly connected and mildly disturbed by edge effects and fragmentation.

Rosenberg's Goanna (*Varanus rosenbergi*) (Vulnerable BC Act)	
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 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,	**Habitat fragmentation:** The habitat to be removed is located alongside the existing Great Western Highway. Its removal will not result in the isolation of patches of habitat. Movement and connectivity for terrestrial fauna are provided by adjacent vegetation including the larger area of suitable habitat within the Blue Mountains National Park. The increase in road width may result in reduced ability for terrestrial fauna to move safely across the road to access habitat on either side. The proposal may slightly increase the risk of vehicle interactions and fatalities; however, this is not expected to be substantial given similar vehicle speeds and long-term presence of the highway already likely discouraging species presence in the immediate vicinity. . **Importance of habitat to be impacted:** Most of the vegetation to be removed within the study area (up to 50.01 ha) would be limited to areas next to the existing highway. The foraging habitat to be removed in this area includes small areas of vegetation next to the existing highway. If present, the species would be unlikely to be dependent on the resources within the REF proposal area and revised proposal area for survival given their requirement for large areas of habitat.
b) 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),	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.
f) 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.	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation • Removal of dead wood and dead trees.
Conclusion: The proposal is considered unlikely to have a significant impact on the Rosenberg's Goanna.	

Squirrel Glider

Squirrel Glider (*Petaurus norfolcensis*) (Vulnerable BC Act)	
Squirrel Glider **Distribution:** The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. The BioNet Atlas has one record within the locality (10 km radius). The Squirrel Glider was not recorded during targeted surveys. **Life cycle, habitat:** Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum Forest west of the Great Dividing Range and Blackbutt-Bloodwood Forest with heath understorey in coastal areas. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. **Impact summary*:*** The proposal will require the removal of a total of up to 50.01 ha of native vegetation (potential foraging habitat), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway as a part of the road upgrade. It will also require the removal of up to 207 hollow-bearing trees (potential nesting/breeding resources).	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
b) 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 proposal would remove up to 50.01 ha of potential foraging and nesting habitat for these species. However, the Squirrel Glider was not recorded within the study area during targeted surveys. There is also only record within the locality indicating it is unlikely to occur within the REF proposal area and revised proposal area. Up to 220 hollow-bearing trees will be directly impacted as they occur within the REF proposal area and revised proposal area. It is unlikely

Squirrel Glider (*Petaurus norfolcensis*) (Vulnerable BC Act)	
	though that these species are limited to the area being impacted due to the presence of the surrounding vegetation. The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement throughout the region. The mobility of these species increases the likelihood of vehicle strike as the existing highway width increases, particularly in the warmer seasons. The increased distance between the eastern and western sides of the existing highways (from 20 metres to 100 metres) may result in some degree of obstruction of fauna movement along this portion of the Great Western Highway. However, the foraging, shelter and nesting resources within the REF proposal area and revised proposal area are unlikely to represent critical habitat for the Squirrel Glider given the species was not detected during targeted surveys and the availability of adjacent habitat. The removal of up to 50.01 ha of habitat adjacent to the exiting highway is unlikely to have an adverse effect on the life cycle of the Squirrel Glider such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures to be employed to avoid/mitigate impacts to the Squirrel Glider will include: • Avoid clearing of potentially suitable nest trees and foraging resources, wherever possible. • Time clearing to avoid breeding season • Pre-clearing surveys of hollow-bearing trees to identify any breeding/nesting individuals • Installation of suitable compensatory habitat (next boxes) at least six months prior to vegetation clearance (as per the nest box plan). Implementation of the mitigation measures will avoid adverse impacts such that a viable local population would be placed at risk of extinction.
c) 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 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,	N/A
d) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and 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 iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species	**Extent of impact on habitat:** Up to 50.01 ha of foraging, dispersal and nesting habitat is likely to be impacted by the proposed actions. These vegetation zones are mostly low to moderate condition and are already disturbed by previous clearing activity. The proposed area will remove up to 220 hollow-bearing trees which further impact nesting habitat. **Fragmentation of habitat:** The foraging and nesting habitat being cleared will not fragment or isolate other areas of habitat as it will be cleared adjacent to the proposed area. The distance separating the areas of native vegetation on the eastern and western sides of the existing Great Western Highway is variable along its length, however, is currently an average width about 20 to 30 metres. The proposal would result in an increase in the distance between the two areas to about 100 metres. There is only 1 record of the Squirrel Glider, almost 10 km to the north of the REF proposal area and revised proposal area. As such, the proposal is considered unlikely to further fragment any local population such that it would be at risk of extinction.

Squirrel Glider (*Petaurus norfolcensis*) (Vulnerable BC Act)	
or ecological community in the locality,	**Importance of habitat to be impacted:** Given the lack of records within the study area following targeted survey and extent of the available habitat in the locality this area of foraging and nesting habitat is not likely to impact the long-term survival of the local population. However, hollow-bearing trees are a limiting and essential resource, required by these hollow-dependent species for breeding and shelter. Nest boxes will be installed as part of the proposal to provide compensatory shelter/breeding resources for these species potentially affected.
e) 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),	No Areas of Outstanding Biodiversity Value will be impacted directly or indirectly
f) 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.	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation • Loss of hollow bearing trees • Removal of dead wood and dead trees.
Conclusion: The proposal is considered unlikely to have a significant impact on Squirrel Glider. Direct impacts to the species will be avoided through implementation of mitigation measures noted above.	

Hollow-dependant Bats

Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (Vulnerable BC Act), Greater Broad-nosed Bat (*Scoteanax rueppellii)*

Eastern Coastal Free-tailed Bat

Distribution: The Eastern Coastal Free-tailed Bat is found along the east coast from south Queensland to southern NSW.

The BioNet Atlas has four records within the locality (10 km radius). The species was recorded on the eastern side of the highway just north of Medlow Bath.

Life cycle, habitat: Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.

Yellow-bellied Sheath-tailed Bat

Distribution: The Yellow-bellied Sheath-tail bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and Northwest Slopes.

The BioNet Atlas has no records within the locality (10 km radius). The species was recorded on the eastern side of the highway just north of Medlow Bath.

Life cycle, habitat: Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.

Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.

Eastern False Pipistrelle

Distribution: The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania.

The BioNet Atlas has 13 records within the locality (10 km radius). The species was not recorded during targeted acoustic surveys.

Life cycle, Habitat: Prefers moist habitats, with trees taller than 20 m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer.

Greater Broad-nosed Bat

Distribution: The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however, does not occur at altitudes above 500 m. The

Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (Vulnerable BC Act), Greater Broad-nosed Bat (*Scoteanax rueppellii)*

BioNet Atlas has seven records within the locality (10 km radius). The species was recorded on the eastern side of the highway just north of Medlow Bath.

Life cycle, habitat: Greater Broad-nosed Bat utilises a variety of habitat types, from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. The species is a low/slow flyer, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species.

The BioNet Atlas has seven records within the locality (10 km radius). The species was recorded during targeted acoustic surveys.

Impact summary*:* The proposal will require the removal of up to 50.01 ha of native vegetation (including 63 hollow-bearing trees that are suitable as roosting habitat), including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway.

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

Criteria	Address of Criteria
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	These hollow-dependent bats have the potential to be adversely impacted by the proposal, particularly the Eastern Coastal Free-tailed Bat, Greater Broad-nosed Bat and Yellow-Bellied Sheath-tailed Bat which were both recorded within the study area. The Eastern False Pipistrelle was not recorded during targeted surveys and therefore the subject area represents potential habitat for this species only. The proposal may require the removal of up to 50.01 ha of known foraging and roosting habitat for the Eastern Coastal Free-tailed Bat, Yellow-Bellied Sheath-tailed Bat and Greater Broad-nosed Bat and potential habitat for the Eastern False Pipistrelle. All the hollow-dependent bats forage in forest canopies, and the Yellow-bellied Sheath-tailed bat also forages in open country. These habitats are present in the low-moderate vegetation to be impacted by the proposal. This habitat within the study area contains 231 hollow-bearing trees which may provide roosting habitat for these species. Up to 220 hollow-bearing trees may be directly impacted as they occur within the REF proposal area and revised proposal area. Of those hollow-bearing trees to be impacted, 63 are considered suitable for hollow-dependant bat species. These species are highly mobile and wide-ranging. It is considered unlikely that these species are limited/restricted to the REF proposal area or revised proposal area. The REF proposal area and revised proposal area are likely constituting a much larger part of the area over which they forage/roost due to the presence of extensive habitat/vegetation within the surrounding landscape. The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement and providing foraging and roosting resources throughout the region. However, the proposal may impact on the life cycle of any individual that may occur within the REF proposal area and revised proposal area through removal of key roosting resources. Mitigation measures to be employed to avoid/mitigate impacts to the hollow-dependent microbats (especially roosting habitat) will include: • Avoid clearing of potentially suitable roost trees wherever possible • Time clearing to avoid breeding season (late spring to early autumn) • Pre-clearing surveys of hollow-bearing trees to identify any breeding/nesting individuals and only undertake clearing once young have left. • Installation of suitable compensatory habitat (next boxes) at least six months prior to vegetation clearance (as per the nest box plan). Implementation of the mitigation measures will avoid adverse impacts such that a viable local population of any of these species would be placed at risk of extinction.

Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (Vulnerable BC Act), Greater Broad-nosed Bat (*Scoteanax rueppellii)*	
	The species are considered unlikely to be impacted by vehicle strike which may be expected to increase for other terrestrial species with the widening of the road and increased traffic volumes due to the fact that they tend to fly high in and through the canopy.
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 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,	N/A
c) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and 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 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,	**Extent of impact on habitat:** Up to 50.01 ha of foraging habitat and 63 potential roost trees may be impacted by the proposal. The vegetation to be removed is mostly low to moderate condition and are already disturbed by existing clearing activity associated with the road corridor/urban development. **Fragmentation of habitat:** The foraging and potential roosting habitat being cleared will not fragment or isolate other areas of habitat as it will be cleared adjacent to the existing highway The distance separating the areas of native vegetation on the eastern and western sides of the existing Great Western Highway is variable along its length, however, is currently an average width about 20 to 30 metres. The proposal would result in an increase in the distance between the two areas to about 100 metres. The habitat within the REF proposal area and revised proposal area on either side of the existing highway is contiguous with vast areas of protected native vegetation within Blue Mountains National Park and Water NSW lands. **Importance of habitat to be impacted:** There are no previous records of the Yellow-bellied Sheath-tailed Bat within the locality and thus this record represents new data regarding a local population of the species. The foraging habitat within the REF proposal area and revised proposal area likely represents a part of the foraging habitat required and used by all of these species; they are highly mobile and may forage over large distances/areas and as such they are considered unlikely to be dependent on the foraging resources within the REF proposal area and Revised proposal area alone for survival. Extensive foraging resources are present within connected bushland adjacent to the REF proposal area and revised proposal area. The loss of potential roosting habitat has the potential to impact the long-term survival of local populations of these species through loss of essential shelter and breeding resources/opportunities.
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),	No Areas of Outstanding Biodiversity Value will be impacted 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.	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation • Loss of hollow bearing trees • Removal of dead wood and dead trees.

Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (Vulnerable BC Act), Greater Broad-nosed Bat (*Scoteanax rueppellii)*	
	Mitigation of direct impacts to roosting bats will be implemented via a Fauna Management Plan (FMP), which will include protocols on pre-clearance assessments, clearing supervision, stop works procedure and the adoption of a habitat replacement procedure. Provided there is some targeted mitigation measures developed to ameliorate any impacts to roosting bats, the proposed works will not significantly contribute to KTPs for the species.
Conclusion: The proposed action is considered unlikely to have a significant impact on the Eastern Coastal Free-tailed Bat, Yellow-bellied Sheath-tailed Bat, Greater Broad-nosed Bat and Eastern False Pipistrelle. Significant impacts to these hollow-dependent microbat species will be avoided through implementation of mitigation measures noted above.	

Cave-dependant Bats

Little Bent-winged Bat *(Miniopterus australis*), Large Bent-winged Bat (M*iniopterus orianae oceanensis*), Eastern Cave Bat (*Vespadelus troughtoni*) (Vulnerable BC Act)	
<u>Little Bent-winged Bat</u> **Distribution:** East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW. The BioNet Atlas has one record within the locality (10 km radius). The species was recorded on the eastern side of the highway just north of Medlow Bath. **Life cycle, habitat:** Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bent-winged bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. **<u>Large Bent-winged Bat</u>** **Distribution:** Eastern Bent-winged bats occur along the east and north-west coasts of Australia. The BioNet Atlas has 34 records within the locality (10 km radius). The species was recorded on the eastern side of the highway just north of Medlow Bath. **Life cycle, habitat:** Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300 km range of maternity caves. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the treetops. **<u>Eastern Cave Bat</u>** **Distribution:** The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. The BioNet Atlas has one record within the locality (10 km radius). This species was not recorded during targeted acoustic surveys. **Life cycle, habitat:** A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. **<u>Impact summary:</u>** The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
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	There is only one previous record for each of the Little Bent-winged Bat and Eastern Cave Bat in the locality. There are 34 previous records of the Large Bent-winged Bat. There is little information available to determine the size of any local population of these species. All these bat species may travel large distances to forage and when not breeding. Given the higher number of Large Bent-wing Bats previously recorded, it is possible there is a maternal colony/roost site in close proximity to the REF proposal area and revised proposal area. Regardless, the proposal is unlikely to have an adverse effect on these cave-dependent bats as it will not impact on any roosting/breeding

Little Bent-winged Bat *(Miniopterus australis*), Large Bent-winged Bat (M*iniopterus orianae oceanensis*), Eastern Cave Bat (*Vespadelus troughtoni*) (Vulnerable BC Act)	
	habitat that has the potential to be used by these species. The proposal would remove up to 50.01 ha of foraging habitat. There is no breeding or roosting habitat available for these species in the study area. As cave-dependent bats are observed to utilise man-made structures, such as bridges, culverts and storm-water drains, the changes to the current features of the Great Western Highway may offer intermittent habitat for these species as individuals and small populations have been recorded in the area. An existing culvert in the proposed area is not currently known to be a suitable breeding or roosting habitat for the species (too small and narrow and no signs of presence). Furthermore, higher quality habitat in the form of natural karst systems are abundant within the broader landscape. It is unlikely though that these species are limited to foraging within the area being impacted due to the presence of the surrounding vegetation. The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement and providing foraging resources throughout the region and in the area immediately adjacent to the REF proposal area and revised proposal area.
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 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,	N/A
c) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and 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 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,	**Extent of impact on habitat**: Up to 50.01 ha of foraging habitat is likely to be impacted by the proposal. The vegetation zones are mostly low to moderate condition and are already disturbed by previous clearing activity. There will be no impacts to known or potential breeding habitat for these species. **Fragmentation of habitat:** The foraging habitat being cleared will not fragment or isolate other areas of habitat as it will be cleared adjacent to the existing highway. The distance separating the areas of native vegetation on the eastern and western sides of the existing Great Western Highway is variable along its length, however, is currently an average width about 20 to 30 metres. The proposal would result in an increase in the distance between the two areas to about 100 metres. The habitat within the REF proposal area and revised proposal area on either side of the existing highway is contiguous with vast areas of protected native vegetation within Blue Mountains National Park and Water NSW lands. **Importance of habitat to be impacted:** The foraging habitat within the REF proposal area and revised proposal area likely represents a part of the foraging habitat required and used by all of these species; they are highly mobile and may forage over large distances/areas and as such they are considered unlikely to be solely dependent on the foraging resources within the REF proposal area and revised proposal area for survival. Extensive foraging resources are present within connected bushland adjacent to the REF proposal area and revised proposal area. There will be no impacts to known or potential breeding habitat for these species, which are of key importance for persistence and survival.

Little Bent-winged Bat *(Miniopterus australis*), Large Bent-winged Bat (M*iniopterus orianae oceanensis*), Eastern Cave Bat (*Vespadelus troughtoni*) (Vulnerable BC Act)	
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),	No Areas of Outstanding Biodiversity Value will be impacted 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.	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation. No suitable cave-dependant bat roosting habitat occurs within the study area (with exception of one culvert identified in the southern portion near Nellies Glen Road). Mitigation of indirect impacts to foraging bats will be implemented via a Fauna Management Plan (FMP), which will include protocols on pre-clearance assessments, clearing supervision, and stop works procedure. Provided the targeted mitigation measures developed to ameliorate any impacts to cave-dependant bats are implemented and there is no further encroachment towards the escarpment areas, the proposed works will not significantly contribute to KTPs for the species.
Conclusion: The proposal is considered unlikely to have a significant impact on the Little Bent-winged Bat, Large Bent-winged Bat and Eastern Cave Bat.	

Woodland Birds

Brown Treecreeper (eastern subspecies) (*Climacteris picumnus*), Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Stagonopleura guttata*), Gilbert's Whistler (*Pachycephala inornata*), Black-chinned Honeyeater (*Melithreptus glumaris gularis*), Little Lorikeet (*Glossopsitta pusilla*) (Vulnerable BC Act).

Brown Treecreeper

Distribution: The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. The south-eastern subspecies is declining while other subspecies appear to be maintaining numbers.

The Brown Treecreeper was recorded within the north of the study area during current surveys. The BioNet Atlas has three records within the locality (10 km radius).

Life cycle, habitat: Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey. Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. Hollows in standing dead or live trees and tree stumps are essential for nesting.

Varied Sittella

Distribution: The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west.

The BioNet Atlas has ten records within the locality (10km radius). The Varied Sittella was not detected during surveys; however, it was recorded in 2019 within one km of the study area.

Life cycle, habitat: The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. The Varied Sittella builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Generation length is estimated to be five years.

The apparent decline of the species has been attributed to declining habitat cover and quality. The sedentary nature of the Varied Sittella makes cleared agricultural land a potential barrier to movement. Survival and population viability are sensitive to habitat isolation, reduced patch size and habitat simplification, including reductions in tree species diversity, tree canopy cover, shrub cover, ground cover, logs, fallen branches and litter. The Varied Sittella is also adversely affected by the dominance of Noisy Miners in woodland patches (as above). Threats include habitat degradation through small-scale clearing for fence lines and highway verges, rural tree decline, loss of paddock trees and connectivity, 'tidying up' on farms, and firewood collection.

Brown Treecreeper (eastern subspecies) (*Climacteris picumnus*), Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Stagonopleura guttata*), Gilbert's Whistler (*Pachycephala inornata*), Black-chinned Honeyeater (*Melithreptus glumaris gularis*), Little Lorikeet (*Glossopsitta pusilla*) (Vulnerable BC Act).

Diamond Firetail

Distribution: The Diamond Firetail is endemic to south-eastern Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and Southwestern Slopes and the Northwest Plains and Riverina.

The BioNet Atlas has two records within the locality (10 km radius). The Diamond Firetail was not detected during the current surveys.

Life cycle, habitat: Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Feeds exclusively on the ground, on ripe and partly ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Usually encountered in flocks of between 5 to 40 birds, occasionally more. Groups separate into small colonies to breed, between August and January. They nest in trees, particularly taller eucalyptus.

Gilbert's Whistler

Distribution: The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia.

The Gilbert's Whistler has not been recorded in the locality of the study area or during current surveys. The BioNet Atlas has no records within the locality (10 km radius).

Life cycle, habitat: The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. Its food consists mainly of spiders and insects such as caterpillars, beetles and ants, and occasionally, seeds and fruits are eaten. Breeding takes place between August and November.

Black-chinned Honeyeater

Distribution: In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina.

The Black-chinned honeyeater has not been recorded in the locality of the study area or during current surveys. The BioNet Atlas has no records within the locality (10 km radius).

Life cycle, habitat: Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbark's, river she oaks (nesting habitat) and tea-trees. Moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects. Nectar is taken from flowers, and honeydew is gleaned from foliage.

Little Lorikeet

Distribution: The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs

The Little Lorikeet has been recorded in the locality of the study area in 2020, however was not detected during the current surveys of the study area. The BioNet Atlas has eight records within the locality (10 km radius).

Life cycle, habitat: Foraging occurs in the canopy of open eucalypt forest and woodland, riparian habitats or isolated flowering trees in paddocks or roadsides. Nesting occurs in hollows in the limb or trunk of trees often smooth-barked eucalypts, entrances are small (3cm) and usually 2-15m high. Nesting season extends from May to September. Roosts in treetops, often distant from feeding areas. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards

Impact summary: The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway.

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

Criteria	Address of Criteria
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	Of the six species listed above, four are considered to have potentially local viable populations due to recent records within the locality; only two species, the Black-chinned Honeyeater and Gilberts Whistler, have not been recorded in the locality and thus it is unknown if they occur. The REF proposal area and revised proposal area may support potential habitat for these species only. The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. Native

Brown Treecreeper (eastern subspecies) (*Climacteris picumnus*), Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Stagonopleura guttata*), Gilbert's Whistler (*Pachycephala inornata*), Black-chinned Honeyeater (*Melithreptus glumaris gularis*), Little Lorikeet (*Glossopsitta pusilla*) (Vulnerable BC Act).	
	vegetation to the north, north-east, west and south-west of the study area is part of a contiguous patch (Blue Mountains National Park and WaterNSW lands). However, portions of the study area have been previously impacted by historical land clearing, agricultural activity and development which has slightly reduced the connectivity. The proposal has the potential to impact woodland birds through removal of breeding habitat (potential sites, or vegetation shielding potential nest sites from the highway), removing shelter sites and reduction of foraging habitat. Habitat present is of variable quality extending 7 km along the linear proposal footprint. The diet of these species varies, but most of the smaller woodland birds rely on invertebrates associated with woodland. The Diamond Firetail relies on native grasses and herbage which is uncommon and very limited in the study area given the native vegetation present is predominately either shrubby or heathy open forest. All of these species rely on woody vegetation for breeding. The Little Lorikeet and Brown Treecreeper utilise hollow bearing trees for breeding. Potential nesting and foraging habitat mainly occur as forest habitats within the study area with moderate to high connectivity within large patches of native vegetation adjacent to the existing highway. Up to 50.01 ha of low to moderate condition forest/woodland will be removed, including up to 220 hollow-bearing trees. Approximately 849.82 ha of native woody vegetation occurs within the 500 m buffer of the study area. With up to 50.01 ha of native vegetation to be removed the proposal will result in the removal of a relatively small proportion (about 5.6 per cent) of potential habitat present within the immediate area. Given the mobility of these woodland species, abundance of adjacent continuous habitat and the relatively small area of potential foraging/shelter habitat to be removed within the locality, these species are considered unlikely to be dependent on the foraging resources within the study area for survival. At least 63 potential breeding trees (0-5 cm hollows) for the Little Lorikeet and Brown Treecreeper may be impacted by the proposal. These trees were not confirmed as breeding/roosting habitat for any of the species during the survey. However, the proposal may impact on the life cycle of any individual that may occur within the REF proposal area and revised proposal area through removal of key roosting/breeding resources. Mitigation measures to be employed to avoid/mitigate impacts to the hollow-dependent woodland birds will include: • Avoid clearing of potentially suitable roost trees wherever possible • Time clearing to avoid breeding season (late spring to early autumn) • Pre-clearing surveys of hollow-bearing trees to identify any breeding/nesting individuals and only undertake clearing once young have fledged. • Installation of suitable compensatory habitat (next boxes) at least six months prior to vegetation clearance (as per the nest box plan). Implementation of the mitigation measures will avoid adverse impacts such that a viable local population of these species would be placed at risk of extinction. Given the large area of similar habitat available within the broader area, the Blue Mountains National Park and Water NSW land, the likely presence of suitable breeding and foraging resources within these areas and the implementation of the mitigation measures detailed above the removal of a relatively small proportion of woodland habitat within the study area is considered unlikely to have an adverse effect on the life cycle of these species such that viable local populations would be placed at risk of extinction.
b) in the case of an endangered ecological community or critically	N/A

Brown Treecreeper (eastern subspecies) (*Climacteris picumnus*), Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Stagonopleura guttata*), Gilbert's Whistler (*Pachycephala inornata*), Black-chinned Honeyeater (*Melithreptus glumaris gularis*), Little Lorikeet (*Glossopsitta pusilla*) (Vulnerable BC Act).	
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 ii) (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	
c) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and 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 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,	**Extent of impact on habitat:** Up to 50.01 ha of native woodland vegetation to be impacted by this proposal is likely to reduce the carrying capacity of the landscape for some of the species being considered. Forested habitats occupying majority of the study area were determined to be moderately to highly connected and mildly disturbed by edge effects and fragmentation. At least 63 hollow bearing trees (which may provide potential breeding habitat for the Brown Treecreeper and Little Lorikeet) would also be impacted by the proposal. None of these species were observed to be utilising the hollow-bearing trees within the study area for breeding/nesting. A further 54 hollow bearing trees were recorded in the study area that will not be impacted by the proposal. The area of impact equates to 5.6 per cent of available native woodland habitat within the surrounding 500 m buffer. The loss of this relatively small area of habitat within the locality is unlikely to have long-term negative impact on the species' local occurrence. For the mobile species, this will result in a lowering of carrying capacity. Species that may be present year-round such as the Varied Sittella, Gilbert's whistler, Brown Treecreeper and Diamond Firetail may be impacted the most. **Habitat fragmentation:** The Brown Treecreeper and Varied Sittella have been documented to be adversely affected by fragmentation and small patch sizes. The proposal will involve the widening of the existing highway which currently already fragments the landscape. The removal of narrow patches of vegetation next to the existing highway is unlikely to further limit dispersal, breeding or foraging activities for any populations of the species that may utilise the potential habitat within the study area. **Importance of habitat to be impacted:** In terms of the long-term survival of these species in the locality, the importance of the area of habitat to be modified is considered to be variable over the length of the study area. The majority of the vegetation to be removed within the study area (up to 50.01 ha) would be limited to areas next to the existing highway. The foraging habitat to be removed in this area includes small narrow areas of vegetation next to the existing highway, including up to 220 hollow-bearing trees which will be removed within the study area. The removal of nesting/breeding resources will be mitigated by installation of compensatory habitat (nest boxes) as per the next box plan. The proposal may slightly increase the risk of vehicle/bird interactions and fatalities; however, the increase is unlikely to be substantial as highway speeds will be similar and the traffic will not increase directly due to the proposal.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area	No declared areas of outstanding biodiversity value will be impacted either directly or indirectly.

Brown Treecreeper (eastern subspecies) (*Climacteris picumnus*), Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Stagonopleura guttata*), Gilbert's Whistler (*Pachycephala inornata*), Black-chinned Honeyeater (*Melithreptus glumaris gularis*), Little Lorikeet (*Glossopsitta pusilla*) (Vulnerable BC Act).		
	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.	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation • Loss of hollow bearing trees • Removal of dead wood and dead trees.
Conclusion: The long-term local occurrence of woodland birds is unlikely to be significantly affected by the proposal given their mobility and the relatively small proportion of foraging habitat/nesting resources that will be directly impacted by the proposal in comparison with available habitat immediately adjacent to the study area. Potential impacts to the species will be minimised through: • Minimising the clearing of native woodland • Restoration of woodland next to the study area and existing woodland remnants wherever possible to maximise habitat patch sizes • Installation of nest boxes to compensate for the loss of hollow bearing trees. • Implementation of pre-clearing surveys and clearing procedures to minimise and avoid impacts to breeding individuals wherever possible. .		

Woodland Robins

Flame Robin (*Petroica phoenicea*), Scarlet Robin (*Petroica boodang*), Hooded Robin (*Melanodryas cucullata*) (Vulnerable BC Act)

Flame Robin

Distribution: The Flame Robin is endemic to south-eastern Australia, and ranges from near the Queensland border to southeast South Australia and in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands.

The Flame Robin has previously been recorded within locality and study area, however, was not detected during current surveys. The BioNet Atlas has 23 records within the locality (10 km radius).

Life cycle, habitat: The Flame Robin breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. The species prefers clearings or areas with open understoreys. The ground-layer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and in herb-fields, heathlands, shrub-lands and sedge-lands at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e., valleys below the ranges, and to the western slopes and plains). The species often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes following regeneration. In winter Flame Robins live in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees and occasionally seen in heathland or other shrub-lands in coastal areas. Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris. Flying insects are often taken in the air and sometimes gleans for invertebrates from foliage and bark. In their autumn and winter habitats, birds often sally from fenceposts or thistles and other prominent perches in open habitats. Occur singly, in pairs, or in flocks of up to 40 birds or more; in the non-breeding season they will join up with other insectivorous birds in mixed feeding flocks. The species breeds in spring to late summer. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. Builds an open cup nest made of plant materials and spider webs.

Scarlet Robin

Distribution: The Scarlet Robin is found from southeast Queensland to southeast South Australia and in Tasmania and southwest Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter.

The Scarlet Robin was recorded within locality, however, was not detected during surveys. The BioNet Atlas has 24 records within the locality (10 km radius).

Life cycle, Habitat: The Scarlet Robin breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter, it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. It forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris. The Scarlet Robin builds an open cup nest of plant fibres and cobwebs, sited in the fork of tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than two metres above the ground (Higgins 2002; Debus 2006a, b). The Scarlet Robin has declined by 55per cent in NSW (Barrett *et al.* 2003, 2007)

The Scarlet Robin is sensitive to habitat degradation (Watson *et al*. 2001, 2003; Radford *et al.* 2005; Radford and Bennett 2007) and overgrazing (Olsen *et al*. 2005). For instance, its occurrence (presence/absence) is positively associated with patch size and components of habitat complexity including increasing tree canopy cover, shrub cover, ground cover, logs, fallen branches and litter (Watson et al. 2003). In a comparison of intensively surveyed woodland sites stratified by habitat attributes and land-use category (Barrett et al. 2003), the Scarlet Robin was found to be: (a) less common in isolated patches of 30 ha or less where there was no tree cover within 200 metres and less than 20% cover within one kilometres; (b) less common in sites surrounded by cattle grazing; (c) absent from sites surrounded by cereal cropping; (d) more common as time increased since removal of grazing; and, (e) more common in sites with native versus exotic grasses if not grazed for more than 10 years. Core bioregions in the Scarlet Robin's NSW range (New England Tableland, Nandewar, NSW Southwestern Slopes and South-eastern Highlands) are 53-84 per cent cleared and moderately to highly stressed (landscape stress factor 3-6 out of 6) (Morgan 2000; Barrett *et al.* 2007).

Hooded Robin

Distribution: The Hooded Robin is widespread across Australia but common in few places. The south-eastern form (subspecies cucullata) is found from Brisbane to Adelaide and throughout much of inland NSW.

The Hooded Robin has not been recorded in the locality of the study area or during current surveys. The BioNet Atlas has no records within the locality (10 km radius).

Life cycle, habitat: It prefers light wooded country, usually open eucalyptus woodland, acacia scrub and mallee, often in or near clearings or open areas. It requires structurally diverse habitat. Territories range from 10 ha during

Flame Robin (*Petroica phoenicea*), Scarlet Robin (*Petroica boodang*), Hooded Robin (*Melanodryas cucullata*) (Vulnerable BC Act)	
breeding season (July to November) to 30 ha in non-breeding season. May breed any time between July and November, often rearing several broods. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 m to 5 m above the ground. A clutch of two to three is laid and incubated for fourteen days by the female. Two females often cooperate in brooding. **Impact Summary:** The proposal will require the removal of up to 50.01 ha of native vegetation, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway as a part of the road upgrade.	
Assessment of significance: An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
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 proposal will require the removal of up to 50.01 ha of native vegetation consisting of woody/forest habitat located next to the existing Great Western Highway. The proposal has the potential to impact woodland robins through removal of shelter sites and reduction of foraging habitat within the woodland areas. However, all these species are known to utilise disturbed habitats, particularly after burning, but also immediately after clearing or heavy grazing. The Flame Robin and Scarlet Robin are known to be local migrants through much of their range, breeding in forested areas and migrating to more open environments during winter. The diet of these species consists of invertebrates; for which they mostly forage on the ground. Flame Robins are prepared to forage well away from cover; Scarlet Robins and Hooded Robins usually inhabit wooded or shrubby country. About 849.82 ha of native woodland/forested habitat occurs within the 500m buffer of the study area. Thus, the proposal will result in the removal of a relatively small proportion (about 5.6 per cent) of habitat present within the surrounding area. Given their relatively wide-ranging habit, the robins are unlikely to be dependent on the resources within the study area for survival. Also, given the relatively small proportion of habitat to be affected, the proposal is considered unlikely to have an adverse effect on the life cycle of these species such that a viable local population would be placed at risk of 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 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	n/a
c) in relation to the habitat of a threatened species or ecological community: i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and ii) whether an area of habitat is likely to become fragmented or isolated from other areas	**Extent of impact on habitat:** The removal of up to 50.01 ha of open forest/woodland impacted by this proposal is likely to reduce the carrying capacity of the landscape for some of the robins, particularly the Scarlet Robin. This equates to 5.6 per cent of available native woodland habitat within 500 m buffer either side of the highway. The habitat loss will result in an incremental, but relatively minor loss to these species. As these are all highly mobile species, this will result in a lowering of carrying capacity rather than direct impact that would be experienced by less mobile

Flame Robin (*Petroica phoenicea*), Scarlet Robin (*Petroica boodang*), Hooded Robin (*Melanodryas cucullata*) (Vulnerable BC Act)	
of habitat as a result of the proposed development or activity, and 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,	species. As the species probably migrate to breed it may not have a large overall effect. The Hooded Robin appears to be uncommon in the locality so any impact upon this population may not be recognisable. **Habitat fragmentation:** The proposal will involve the widening of the existing highway which currently already fragments the landscape. The proposal is unlikely to further limit dispersal, breeding or foraging activities for any population of the species that may utilise the potential habitat within the study area. **Importance of habitat to be impacted:** The woodland habitat to be removed next to the existing highway is unlikely to represent habitat of local importance for the Scarlet Robin and Flame Robin given the availability of adjacent connected habitat. As the Hooded Robin has not been recorded in the study area, the study area may have a lesser importance for this species. The proposal may slightly increase the risk of vehicle/bird interactions and fatalities; however, the increase is unlikely to be substantial as highway speeds will be similar and the traffic will not increase directly due to the proposal.
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),	No declared areas of outstanding biodiversity value will be impacted 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.	The following KTPs are known to exist or have the potential to be exacerbated by the proposal: • Clearing of native vegetation • Loss of hollow bearing trees • Removal of dead wood and dead trees. All the robins could be impacted by clearing of native vegetation. Shelter from predators is important for all the species, even for the Flame Robin that will forage in the open areas. However, given the transient nature of the species and use of a wide range of habitats, the proposal is unlikely to significantly contribute to KTPs for the three robin species.
Conclusion: The long-term local occurrence of woodland robins is unlikely to be significantly affected by the proposal given their highly mobile and wide-ranging habit and the relatively small proportion of highway side habitat that will be impacted by the proposal.	

Annexure E

EPBC Act Significant Impact Criteria assessments

Needle Geebung

Needle Geebung is listed as vulnerable under the BC Act and EPBC Act. Needle Geebung have been recorded only on the Central Coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. It mainly occurs in the Katoomba/ Wentworth Falls/ Springwood area.

Needle Geebung occurs in dry sclerophyll forest, scrubby low-woodland, and heath on low fertility soils. The species seems to benefit from the reduced competition and increased light available on disturbance margins including roadsides (OEH 2019).

Key threatened processes for Needle Geebung include (OEH 2019):

- Loss of habitat through clearing for urban and small-rural-lot development
- Burning for hazard reduction and other unnatural ignitions have increased fire frequency and may threaten the species' survival
- Weed invasion on trail and road margins and on the edge of bushland
- Many Persoonia species are killed following infection by *Phytophthora cinnamomi*
- Habitat disturbance during road maintenance
- Lack of knowledge about the distribution of the species and threats
- Localised distribution places the species at risk of extinction.

Potential impacts applicable to the Great Western Highway upgrade include loss of habitat through vegetation clearing, weed incursion, and habitat disturbance. Provided the mitigation measures are implemented, the proposal is considered unlikely to result in a significant impact to an important population of Needle Geebung.

Needle Geebung (Vulnerable, BC Act and EPBC Act)	
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	The proposed Great Western Highway upgrades are being undertaking along and adjacent to the existing road corridor where one Needle Geebung individual was identified in the southern extent of the REF proposal area near Nellies Glen Road, within moderate condition PCT 1248. A thorough search of the entire study area has been undertaken to identify additional individuals. No other individuals were identified within the study area. The closest records of the species include three individuals located 2 km to the south-west of the study area in the Megalong Valley. The individual within the study area is likely to represent a separate subpopulation to those in the Megalong Valley due to geographical/topographical separation of the individuals and limitation of cross-pollinating opportunities by bees. Other records within 3 km of the species to the south and east, and of similar altitude, may constitute the same population, dependant on the pollination requirements of the species. However, as per the threatened species Test of Significance guidelines (OEH (2018), the local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. Given only one individual was located within the study area (and the surrounding area up to 100 m from the individual was surveyed), the local population is considered to consist of one individual. Bonnie Doon Reserve is located adjacent and to the south-east of the species location. There are no current records for the species in this area. However, this area supports the same habitat as recorded within the REF proposal area and revised proposal area. It therefore presents potential habitat for the species in close proximity to the recorded specimen. There are at least 250 records of the species within the locality. The species is known from the Blue Mountains National Park, one historical record from Kanangra-Boyd National Park and areas managed by Blue Mountains City Council at Woodford Dam, a reserve at Leura, Adelina Falls at Lawson, and Hassans Walls Reserve at Lithgow. Some sites are known to support many individuals (up to 40 plants over a few hundred metres in some locations). Given the known records of 250 individuals within the locality, the presence of populations supporting many individuals and the location of known populations within protected reserves, it is considered that the habitat and population of one individual within the REF proposal area is of relatively low importance to the long-term survival of the species in the locality.

Needle Geebung (Vulnerable, BC Act and EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	However, the individual occurs within the proposed road alignment and will be directly impacted by the proposal which will lead to a long-term decrease in the size of the local population of one.
reduce the area of occupancy of an important population	Due to the restricted distribution of habitat and small population sizes, OEH considers that all habitat of Needle Geebung should be considered significant. The proposed works will directly impact (reduce) the area of occupancy of the recorded individual. According to Environmental Impact Assessment Guidelines (OEH 2000) for the species, the minimum size of a viable local population of Needle Geebung is unknown. However, in the absence of detailed population viability analysis, OEH considers that all populations should be considered viable. The proposal will result in the removal of up to 50.01 of woodland/forest habitat. However, no other individuals were found to occur despite targeted searches. Therefore, the proposal will result in the removal of a very small area of known habitat supporting one individual only and is unlikely to reduce the area of occupancy such that it would have a significant impact on the species.
fragment an existing important population into two or more populations	Populations of *Persoonia acerosa* tend to be naturally isolated and fragmented across much of its range. The proposal will remove a small population (one individual). There are no known areas of occupied habitat within 100 m of the recorded individual, or anywhere else in the REF proposal area. As such, the proposal will not fragment an existing population into two or more populations.
adversely affect habitat critical to the survival of a species	The individual that was identified during field surveys was clearly demarcated and protected during the geotechnical investigations, however, is likely to be directly impacted by the upgrade works. The habitat in the locality of the one Needle Geebung plant is considered important for the survival of the population at that location. The local population supports only one individual. As mentioned above, there are at least 250 records of the species within the locality. The species is known from the Blue Mountains National Park, one historical record from Kanangra-Boyd National Park and areas managed by Blue Mountains City Council at Woodford Dam, a reserve at Leura, Adelina Falls at Lawson, and Hassans Walls Reserve at Lithgow (DOE species info). Some sites are known to support many individuals (up to 40 plants over a few hundred metres in some locations). Given the known records of 250 individuals within the locality, the presence of populations supporting many individuals and the location of known populations within protected reserves, it is considered that the habitat within the REF proposal area and revised proposal area is unlikely to be critical to the survival of the species in the locality. As such the proposal will not adversely affect habitat critical to the survival of the species.
disrupt the breeding cycle of an important population	The proposal is likely to disrupt the dispersal/recruitment of an important population through the removal of the one individual.
modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project will decrease the availability of habitat of a known important population supporting one individual *Persoonia acerosa*. Given the number of individuals and populations known to occur in the locality, the removal of habitat for one individual is considered unlikely impact the species such that it is likely to decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The project will require the removal of native vegetation along the existing highway, which will increase susceptibility to invasive species encroachment. However, standard hygiene protocols, weed management, sediment/erosion control, No-Go-Zones and rehabilitation with native vegetation will be implemented to reduce any cross-contamination of soil pathogens and establishment of other exotic species.
introduce disease that may cause the species to decline, or	As stated above, during the works, standard soil hygiene practices, sediment/erosion controls and No-Go-Zones will be implemented to reduce any cross-contamination of soil pathogens (e.g., *Phytophthora cinnamomi*) and other diseases. Therefore, the works are unlikely to introduce disease that may cause the species to decline.

Needle Geebung (Vulnerable, BC Act and EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
interfere substantially with the recovery of the species.	The proposal will not interfere substantially with the recovery of known important populations of *Persoonia acerosa*.
Conclusion: The Proposal will result in the removal of one individual representing a small local population. This population is considered unlikely to be important to the long-term survival of the species and therefore a significant impact to the species is considered unlikely. Seed collection will be undertaken in an effort to aid in re-establishment of individuals as part of revegetation works for the proposal.	

Temperate Highland Peat Swamps on Sandstone

Two nominations were submitted for peat swamps on sandstone sediments in the highlands of temperate eastern Australia:

- Blue Mountains Swamps; and
- NSW Southern Highlands Montane Peat Swamps.

Other temperate peat swamps on sandstone were identified by experts as being alike to the peat swamps identified in the above nominations. Due to the similarity of the two nominated ecological community components and the additional components identified by experts, it is recommended that they be assessed as a national ecological community: Temperate Highland Peat Swamps on Sandstone (DAWE 2021a).

Temperate Highland Peat Swamps on Sandstone is listed as Endangered under the EPBC Act and Vulnerable under the BC Act. The Blue Mountains Swamps occur between 800-950m above sea level and has previously been observed on freehold land or National Parks.

Components of the Temperate Highland Peat Swamps on Sandstone ecological community are either temporary or permanent swamps. These swamps are found in a range of locations in the landscape, from hanging swamps in the Blue Mountains to the valley and watercourse swamps of Wingecarribee Swamp and the Paddy's River Swamps. Hanging swamps are especially notable in the landscape as they occur on steep valley sides in wet areas created by water exiting the ground at joins between sandstone and claystone layers of rock. The other swamps in this ecological community occur in depressions in the landscape, or along watercourses.

The location of the Temperate Highland Peat Swamps on Sandstone ecological community in the landscape plays an important role in determining the level of waterlogging and the amount of sedimentation that occur in the swamps. Hanging swamps have low levels of sedimentation, and accumulate organic material slowly, while valley swamps and those along watercourses have greater levels of sedimentation and accumulate organic material more quickly. The difference in the accumulation of organic material is important for the depth of the peat on which these swamps are based: shallow in the hanging swamps and deep in the swamps on valley floors.

The interaction of location, waterlogging, sedimentation, and fire history impact on the vegetation found within the various components of the Temperate Highland Peat Swamps on Sandstone ecological community. The vegetation associated with this ecological community is a complex patchwork of vegetation types and varies from bog and fen associations in the wettest parts of some components, through to sedge associations, and shrub associations in the driest parts of the ecological community.

Nearly all of the components of the Temperate Highland Peat Swamps on Sandstone ecological community have been affected by physical disturbance caused by introduced animals. The introduced animals

identified from components of the Temperate Highland Peat Swamps on Sandstone ecological community include cattle, horses, rabbits, foxes, pigs, cats and dogs.

Key threatened processes for Needle Geebung include (DAWE 2021b):

- Land clearance
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases.

Potential impacts applicable to the Great Western Highway upgrade include loss of habitat through indirect vegetation clearing, weed incursion, erosion, and habitat disturbance. Provided the mitigation measures are implemented, the proposal is considered unlikely to result in a significant impact to an important population of Temperate Highland Peat Swamps on Sandstone.

Temperate Highland Peat Swamps on Sandstone (Vulnerable BC Act, Endangered EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
reduce the extent of an ecological community	The proposed Great Western Highway upgrades are being undertaking along and adjacent to the existing road corridor. Originally, the proposed northbound carriageway bridge spanned the small patch (0.06 ha) of Temperate Highland Peat Swamps on Sandstone and had proposed piers located within the eastern margins of the swamp. After consultation and a design meeting (30 September 2021), the bridge design was amended to avoid direct impacts to the swamp, such that the eastern-most extent of the swamp falls in the middle of the span between the two piers to maximise the distance of the swamp from the bridge piers. Therefore, the bridge piers (and access track for construction works) will avoid direct impacts on the swamp. There will be a buffer area of at least 5 m between the construction zone and margin of the swamp and there will be no direct impact in this buffer zone. The swamp will avoid any direct impacts associated with the Project. Through design refinement and implementing the targeted mitigation measures, the project will aim to avoid direct impacts to the TEC. For example, through erosion and sedimentation run-off controls, No-Go-Zones, suspended work platforms with scaffold mesh and regular monitoring. The project will avoid any direct impacts to the habitat of the TEC. With appropriate consideration to avoid the TEC, the proposal is considered unlikely to reduce the extent of the ecological community.
fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The proposal is unlikely to fragment or isolate the TEC as the REF proposal area is located to the east of the swamp margin. Indirect impacts have the potential to occur on the eastern-most margin of the swamp, however these impacts would not further fragment or isolate the area of TEC present. Direct and indirect impacts to the extent of swamp within the REF proposal area have been avoided through consultation and design refinement and the implementation of a range of targeted mitigation actions (such as protective and sediment fencing around the perimeter of the swamp during construction).
adversely affect habitat critical to the survival of an ecological community	The swamp TEC will not be directly impacted or cleared by the proposal. However, the proposed construction of the northbound carriageway bridge has the potential to reduce genetic diversity and long-term evolutionary development of the TEC via increased sedimentation, change in hydrological processes and erosional issues. By reducing the genetic diversity of the community and long-term evolutionary development, the proposal has the potential to affect habitat critical to the survival of the community. Implementation of stringent measures to avoid and mitigate indirect impacts to the TEC will ensure that the risk of adverse impacts to the community are reduced.
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	The proposal will not directly modify the surface vegetation due to clearing. Mitigation measures will be in place to reduce the impacts to the change in any abiotic factors including reduction of groundwater or 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	Through design refinement and the implementation of the targeted mitigation measures, the proposal will aim to avoid direct impacts to the TEC. As such, the proposal will not cause a substantial change in the species composition of an occurrence of an ecological community.
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	The proposal will implement standard hygiene protocols, weed control measures, sediment/erosion control and No-Go-Zones to reduce any cross-contamination of soil pathogens (e.g., *Phytophthora cinnamomi*) and other exotic species. There will be no use of chemicals or herbicides or other pollutants into the ecological community. Therefore, the works are unlikely to introduce invasive species greater than is existing in the proposal area that may cause the species to decline.
interfere with the recovery of an ecological community.	There is no adopted or made Recovery Plan for this ecological community. The proposal will aim to support the recovery of known important habitat for the TEC, given the TEC also occurs in the wider locality.
Conclusion: The proposal is considered unlikely to have significant impact to an area of *Temperate Highland Peat Swamps on Sandstone.* Implementation of mitigation measures will ensure potential indirect impacts are avoided/mitigated.	

Large-eared Pied Bat

Large-eared Pied Bat is listed as vulnerable under the BC Act and EPBC Act (DAWE 2011b). The distribution of Large-eared Pied Bat is discontinuous and ranges from Shoalwater Bay in Queensland through to Ulladulla in New South Wales. The species has been found roosting in caves, overhangs, abandoned mine tunnels and disused fairy martin nests (Hoye & Dwyer 1995; Schulz 1998). No evidence exists of the Large-eared Pied Bat roosting in tree hollows.

In accordance with the habitat requirements outlined in the BAM-C and in survey guidelines for Australia's threatened vats (DEWHA 2010; OEH 2018b), the entire proposal area is considered foraging habitat for this species given its locality is within two km of escarpment area with known overhangs and karst systems.

Over most of its range, the large-eared pied bat appears to roost predominantly in caves and overhangs in sandstone cliffs and forage in nearby high-fertility forest or woodland near watercourses. The presence of suitable caves or overhangs may be more important than the precise geology. This species has been recorded foraging in a range of vegetation types, including dry and wet sclerophyll forest, grassy woodland, Callitris dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland and sandstone outcrop country (DAWE 2011b).

The occurrence of high-fertility forest or woodland near suitable roosting habitat is rare in the landscape, which implies that the species may always have been uncommon; however preferential clearing of fertile forests and woodlands has almost certainly reduced the amount of available habitat considerably.

Key threatened processes for Large-eared Pied Bat include (DAWE 2011b):

The lack of detailed information regarding the distribution, abundance and ecological requirements of the large-eared pied bat makes an assessment of threats difficult.

Destruction of, and interference with maternity and other roosts (e.g., mining of roosts; mine induced subsidence of clifflines; disturbance from human recreational activities; habitat disturbance by introduced species)

- Vegetation clearing in the proximity of roosts
- fire in the proximity of roosts
- Use of pesticides.

Large-eared Pied Bat (Vulnerable BC Act and EPBC Act)	
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	The largest known populations of the Large-eared Pied Bat occur in those areas dominated by sandstone escarpments. Within NSW, based on available records, the largest concentration of populations appears to be in the sandstone escarpments of the Sydney basin and northwest slopes of NSW. Given that the proposed Great Western Highway upgrades are not in close proximity to any critical habitat (maternity sites or karst systems,) and are being undertaking along and adjacent to the existing road corridor, it is highly unlikely that important populations that occupy the escarpment areas to the west (more than 300 m away) will be directly impacted by the proposal. Therefore, the works are unlikely to lead to a long-term decrease in the size of an important population of Large-eared Pied Bat.
reduce the area of occupancy of an important population	In accordance with the recovery plan (DAWE 2011b), the species is listed as occurring in the Blue Mountains National Park area. Given that native vegetation within the construction footprint is to be cleared to accommodate for the highway upgrade works, the area of occupancy (primarily foraging) will be further reduced by up to 50.01 ha. However, given the surrounding escarpment area is highly connected and foraging resources are plentiful, it is unlikely to adversely impact the species.
fragment an existing important population into two or more populations	It is postulated that small, fragmented sub-populations of the Large-eared Pied Bat may be at a greater risk of extinction from random events as a result of a loss of genetic variability, which can lead to inbreeding depression and / or decreased evolutionary potential to adapt to environmental changes. To date, there have been no genetic studies undertaken on the Large-eared Pied Bat. Movement of this species between areas has not been recorded and its dispersal ability and habits are not known. This bat has relatively short, broad wings suggesting high manoeuvrability and relatively slow flight. Species with these characteristics typically forage

	below the canopy. Short, broad wings also suggest that its dispersal ability may be significantly less than another, better studied cave roosting species, Large Bentwing-bat *Miniopterus orianae oceanensis*. Significant clearing of vegetation is likely to have further decreased the ability of individuals to move between areas of suitable habitat (DAWE 2011b). The existing Great Western highway has historically fragmented habitats between the western and eastern escarpment areas. The proposed works are likely to increase fragmentation in the locality. However, this is unlikely to adverse impact any local populations as the species are highly mobile/transient and there is likely to be smaller existing sub-populations of the species found either side of the highway.
adversely affect habitat critical to the survival of a species	Large-eared Pied Bat is dependent on the presence of diurnal roosts for shelter. Roosts are utilised during the day and also at night when not feeding, as well as for the raising of young. This species has been known to roost in disused mine shafts, caves, overhangs and abandoned fairy martin *Hirundo ariel* nests. There are only a couple of maternity roosts known in NSW. Any maternity roosts must be considered habitat critical to the survival of the species. Given that the proposal area only contains potential foraging habitat (and opportunistic day roost habitat, if martin nets are present), the proposal is considered unlikely to adversely affect habitat critical to the survival of Large-eared Pied Bat.
disrupt the breeding cycle of an important population	The proposed works are more than 300 m away from any escarpment habitat and therefore, will not disrupt the dispersal/recruitment 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	The proposal will decrease foraging habitat for the species by up to 50.01 ha, however, there is abundant foraging resources found in adjacent areas. Therefore, the proposal will not substantially modify and decrease the availability of habitat of a known important population of Large-eared Pied Bat.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposal will not result in the introduction of invasive species that are likely to impact Large-eared Pied Bat habitat.
introduce disease that may cause the species to decline, or	As stated above, the proposal will not result in the introduction of diseases that are likely to impact Large-eared Pied Bat.
interfere substantially with the recovery of the species.	The proposal will not interfere substantially with the recovery of known important population of Large-eared Pied Bat.
Conclusion: Based on the above considerations, the proposal is considered unlikely to have a significant impact on an important population of the Large-eared Pied Bat.	

Koala

In assessing the significance of the impact from the proposal on the Koala, the '*EPBC Act referral guidelines for the vulnerable koala*' (Commonwealth of Australia 2014) were applied to the assessment. Note it is understood that recent listing of the Koala from Vulnerable to Endangered has rendered these guidelines obsolete. However, they have been used, in lieu of any updated guidelines, to assess the quality of potential Koala habitat in the REF proposal area and Revised proposal area. The following information is presented prior to the Assessment of Significance for the Koala to demonstrate application of the guidelines and to assist with understanding the assessment and its conclusion.

Koala Habitat Assessment Scoring (Commonwealth of Australia 2014):

Attribute	Score	Coastal	Comment (score)
Koala occurrence	+2 (high)	Evidence of one or more Koalas within the last 2 years.	No
	+1 (medium)	Evidence of one or more Koalas within 2 km of the edge of the impact area within the last 5 years.	No
	0 (low)	None of the above.	**Yes (0).** The BioNet Atlas has nine records within the locality (10 km radius). Two of those records are located about 9.5 km to the north of the REF proposal area along the Great Western Highway (from 2004 and 2020).
Vegetation composition	+2 (high)	Has forest or woodland with 2 or more known Koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	**Yes (+2).** The study area contains a number of Koala use tree species as listed under the SEPP (Koala Habitat Protection) 2021 for the Central and southern Tableland's Koala Management Area. Including, the dominant Silvertop Ash (*Eucalyptus sieberi*) and Sydney Peppermint (*Eucalyptus piperita*). In addition, for the Central and Southern Tablelands, Ribbon Gum (*Eucalyptus viminalis*; Primary food tree) and Brittle Gum (*Eucalyptus mannifera*; secondary food tree) were identified in low densities in the eastern portion of the proposal footprint (DECC 2008).
	+1 (medium)	Has forest or woodland with only 1 species of known Koala food tree present.	No
	0 (low)	None of the above.	No
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	**Yes (+2).** The study area directly adjoins large intact areas of native vegetation including the Blue Mountains National Park.
	+1 (medium)	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.	No
	0 (low)	None of the above.	No
Key existing threats	+2 (high)	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	No
	+1 (medium)	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence, **OR** Areas which score 0 for Koala occurrence and are likely to have some degree dog or vehicle threat present.	No

Attribute	Score	Coastal	Comment (score)
	0 (low)	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for Koala occurrence and have a significant dog or vehicle threat present.	**0 (existing threat of vehicle strike).** The study area is located adjacent to the existing Great Western Highway which presents the risk of vehicle strike.
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	No
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	No
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	See below (0) The connectivity of the locality is not adversely impacted by the removal of the habitat within the study area.
Total	**4/10**		The REF proposal area and revised proposal area does not contain habitat identified as critical for the species (i.e. a score >5).

Koala (*Phascolarctos cinereus*) (Vulnerable BC Act and EPBC Act)	
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	The potential habitat to be removed is adjacent to the existing Great Western Highway subject to varying degrees of disturbance and in low to moderate condition. The occurrence of Koala use tree species as listed by the SEPP (Koala Habitat Protection) 2021 is dominant throughout the study area. However, the native vegetation to be removed likely represents secondary Koala habitat (as per DECC 2008) given the low number of previous records within close proximity and low numbers of primary or secondary food trees present. Secondary habitat is defined as "*Primary food tree species absent, habitat comprised of secondary and supplementary food tree species only. Capable of supporting viable, low-density populations (< 0.10 koala/ha*)" (DECC 2008). In addition, previous records within the locality indicate that if Koalas were to use the study area, would only do so on an occasional basis. Only nine BioNet records occur within 10 km and only one of these was within the last five years. It is unlikely that the study area supports a breeding population of Koalas. In addition, large intact habitat adjoins the study area within the Blue Mountains National Park providing extensive habitat within the locality. The proposal may increase the risk of vehicle strike due to an increased road width. However, it is unlikely to result in substantial traffic increases and appropriate mitigation including continued speed control and awareness will reduce potential roadkill. The proposal is considered unlikely to lead to a long-term decrease in the local population.
reduce the area of occupancy of an important population	Up to 50.01 ha of native vegetation will be removed representing potential Koala habitat most likely used as supplementary habitat. The study area is unlikely to be regularly used or represent core Koala habitat based on previous records, tree species present and location next to the existing highway.
fragment an existing important population into two or more populations	The habitat to be removed is adjacent to the existing highway which is an existing barrier from habitat patches on the eastern and western sides of the highway. The proposal will not fragment existing known populations. The increase in road width may result in reduced ability for terrestrial fauna (Koala) to move safely across the road to access patches of habitat on either side. However, the existing highway and railway line currently act as a barrier for fauna movement and have done so for many years. It is likely that populations on either side of the road are already isolated from each other to a certain extent, and that animals may be somewhat habituated to the road. Movement and connectivity on either side of the highway are retained by the larger areas of intact, contiguous vegetation in the wider locality and Blue Mountains National Park.

Koala (*Phascolarctos cinereus*) (Vulnerable BC Act and EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
adversely affect habitat critical to the survival of a species	Given that native vegetation within the REF proposal area and revised proposal area is to be cleared to accommodate the highway upgrade works, up to 50.01 ha of supplementary habitat will be removed. However, given the surrounding habitat is highly connected and foraging resources are plentiful, it is unlikely to adversely impact habitat critical to the survival of the species.
disrupt the breeding cycle of an important population	The study area is unlikely to represent breeding habitat given its location next to the existing highway, lack of primary feed trees, existing disturbances, low numbers of BioNet records in close proximity (two within 3 km and nine within 10 km) and only one potential Koala scat recorded during surveys. As such, the proposal is unlikely to 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	Approximately 849.82 ha of native woody vegetation occurs within the 500 m buffer of the study area. With up to 50.01 ha of native vegetation to be removed the proposal will result in the removal of a relatively small proportion (about 5.6 per cent) of potential habitat present within the immediate area. No habitat will be isolated as a result of the proposal. The vegetation removed is adjacent to the existing highway. It is unlikely, based on the relatively small proportion of potential habitat to be removed (about 5.6 per cent within a 500 m buffer), abundance of adjacent habitat and location adjacent the existing highway, that the proposal may result in an impact that will cause the species to decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposal will not result in the establishment of invasive species.
introduce disease that may cause the species to decline, or	The proposal will not introduce a disease harmful to the Koala.
interfere substantially with the recovery of the species.	The proposal will not result in the fragmentation or isolation of Koala habitat. Large, connected areas of Koala habitat capable of supporting a viable population will remain in the locality. It is unlikely the study area represents breeding habitat given lack of previous records. Corridors and connective habitat will remain in the locality to facilitate Koala movement.
Conclusion: Based on the above considerations, the proposal is considered unlikely to have a significant impact on an important population of the Koala.	

In accordance with the EPBC Act referral guidelines, impact areas that score five or more using the habitat assessment tool for the Koala contain habitat critical to their survival. However, given that the density of known feed trees (Ribbon Gum and Brittle Gum) was identified in very low densities in the eastern portion of the REF proposal area and revised proposal area and the low number of Koala records within the locality (total nine and only one within 5 years) it is unlikely that the proposal would result in a significant impact to an important population of the Koala. Therefore, commonwealth referral is not recommended.

Grey-headed Flying-fox

Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable BC Act and EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
lead to a long-term decrease in the size of an important population of a species	According to the National Flying-fox monitor, there are no nationally important flying-fox camps known between Katoomba and Blackheath (DAWE 2015). The closest know camp site occurs at Emu Plains (approximately 35 km east of the proposal, DAWE 2015). Field surveys during Spring and Winter did not identify any established camps within the proposal area. There are numerous records in the locality, and it is likely that the species may use the habitat within the REF proposal area and Revised proposal area on occasion as a foraging resource. The REF proposal area and revised proposal area does not support any other important populations identified in the recovery plan (DAWE 2021c) or population with significant genetic diversity Spatially, the REF proposal area and revised proposal area is near the limit of the species known range. Impacts of the proposal would be restricted to a small amount of foraging habitat adjacent to the existing highway (up to 50.01 ha). Given the abundance of potential foraging habitat, and other areas of native vegetation within the locality, the removal of up to 50.01 ha of potential foraging habitat located along the existing highway is considered unlikely to have impacts on important life-cycle stages of this species such that a viable local population of the species would be placed at risk of extinction. The proposal area is distant from any known roost sites, and it is not expected that mortality from vehicle strike is likely to increase.
reduce the area of occupancy of an important population	The REF proposal area and revised proposal area is near the limit of the known species range (DAWE 2015). Impacts of the proposal would be restricted to a small amount of foraging habitat adjacent to the existing highway (up to 50.01 ha). Given the abundance of potential foraging habitat, and other areas of native vegetation within the locality, the removal of up to 50.01 ha of potential foraging habitat located along the existing highway is considered unlikely to have impacts on the species occupancy or migration between food resources.
fragment an existing important population into two or more populations	According to the National Flying-fox monitor, there are no nationally important flying-fox camps known between Katoomba and Blackheath (DAWE 2015). Due to the transient nature of the species, constant genetic exchange and movement, there is not one single breeding population. Given the high mobility of the species, clearing for the proposal would be unlikely to increase fragmentation for this species.
adversely affect habitat critical to the survival of a species	Critical habitat defined for the survival of the Grey-headed Flying-Fox includes (DAWE 2021c): • Important winter and spring vegetation communities that contain *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia or Syncarpia glomulifera* • native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May) • native species used for foraging and occur within 20 km of a nationally important camp as identified on the Department's interactive flying-fox web viewer, or • native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying-Fox camp1 as identified on the Department's interactive flying-fox web viewer. Regarding the proposal area, it supports vegetation that may provide suitable foraging habitat, however, it does not support any of the tree species identified above as critical habitat. Foraging habitat loss is the primary threat for Grey-headed Flying-fox, however due to the irregular flowering of food trees, it is difficult to accurately predict impacts (DAWE 2021c). With complex habitat requirements, including multiple, geographically dispersed foraging habitats, conservation solely within a system of conservation reserves is difficult as the species is vulnerable to land use decisions outside such reserves. The proposal would result in the removal of approximately up to 50.01 ha of native vegetation which may provide foraging habitat for the Grey-headed Flying-fox. Over 849.82 ha of similar habitats (woody vegetation) are mapped within the 500 m buffer, therefore the proposal would remove 5.6 per cent of similar habitats in the surrounding area. The foraging habitat in the proposal area is already fragmented by the existing highway. The area of vegetation to be impacted by the proposal occurs alongside the existing road. Given the high mobility of these species, clearing from the proposal would be unlikely to adversely affect habitat critical to the

Grey-headed Flying-fox (*Pteropus poliocephalus*) (Vulnerable BC Act and EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	survival of the species. The species is unlikely to be dependent on the limited resources within the proposal area for the long-term survival in the locality.
disrupt the breeding cycle of an important population	Due to the nomadic nature of species, constant genetic exchange and movement, there is not one single breeding population. Depending on the time of the project being implemented may potentially impact species aggregation for mating or female gestation and birth. However, given there are no significantly close camps/breeding/roosting habitats near the REF proposal area and revised proposal area, the closest known camp site occurs at Emu Plains (approximately 35 km east of the study area, DAWE 2015) it is unlikely the proposal will disrupt the breeding cycle of the species. Given the abundance of potential foraging habitat, and other areas of native vegetation within the locality, the removal of up to 50.01 ha of potential foraging habitat located along the existing highway is considered unlikely to have impacts on important life-cycle stages of this species such that a viable local population of the species would be placed at risk of extinction.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal area is near the limit of the known species range, with the closest known camp 35 km to the east of the proposal area in Emu Plains (DAWE 2015). Grey-headed Flying-fox are known to travel up to 15 km in the day, and 50 km at night from their roost. This species requires a continuous sequence of productive foraging habitat (as seasons change), as migration corridors, and as stopover habitat as they commute between camps (DAWE 2021c). The REF proposal area and revised proposal area does not qualify as critical habitat due to lack of roosting individuals/camps and lack of key foraging tree species; however, it may play an important role in providing supplementary stop-over foraging habitat (DAWE 2021c). Foraging habitat loss is the primary threat for Grey-headed Flying-fox, however due to the irregular flowering of food trees, it is difficult to accurately predict impacts (DAWE 2021c). The proposal may remove up to 50.01 ha of potential foraging habitat (DAWE 2021c), however over 849.82 ha of similar habitats (woody vegetation) are mapped within the 500 m of the REF proposal area and revised proposal area, therefore the proposal would remove 5.6 per cent of similar habitats in the surrounding area. It is overall unlikely that the clearing resulting from the proposal will significantly modify or destroy the availability or quality of habitat to the extent of species decline would decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposal is unlikely to result in establishment of invasive plant or animal species that would be harmful to the Grey-headed Flying-fox.
introduce disease that may cause the species to decline, or	Incidence of Australian Bat Lyssavirus (ABL) is very low (<1%), little is known about Bat Paramyxovirus, and 25% of wild flying-fox carry antibodies to Menangle Pig Virus. It is unlikely that the proposal may introduce disease that may cause species decline.
interfere substantially with the recovery of the species.	No important populations have been recorded in the REF proposal area and revised proposal area (DAWE 2015; 2021c). Complex habitat requirements, including multiple, geographically dispersed foraging habitats, prevents conservation solely within a system of forest reserves. As such, this species is vulnerable to land use decisions outside such reserves. The proposal may impact up to 50.01 ha of potential foraging habitat (DAWE 2021c), however over 849.82 ha of similar habitats (woody vegetation) are mapped within the 500m buffer, therefore the proposal would remove up to 5.6 per cent of similar habitats in the surrounding area. The proposal impacts are unlikely to substantially interfere with the recovery of the species.
Conclusion: Based on the above considerations, the proposal is considered unlikely to have a significant impact on a population of the Grey-headed Flying-fox.	

Greater Glider

Distribution: The Greater Glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. Within the Sydney Basin the Greater Glider can be found in Sydney Montane Dry Sclerophyll Forests, higher parts of Greater Blue Mountains sandstone plateau, the southern Illawarra Escarpment between Avon River, Macquarie Pass and Belmore Falls, and on the elevated sandstone plateau of the northern Budawang Mountains.

The BioNet Atlas has 70 records within the locality (10 km radius). It was not recoded during targeted surveys for the species.

Life cycle, habitat: The Greater Glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands 10-25 m tall with a diverse and distinctive sclerophyll shrub understorey. The open groundcover is characterised by prostrate shrubs and sclerophyll sedges. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. The Greater Glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees. In southern Queensland, greater gliders require at least 2−4 live den trees for every 2 ha of suitable forest habitat. Home ranges are typically relatively small (1−4 ha) but are larger in lower productivity forests and more open woodlands (up to 16 ha). They are larger for males than for females with male home ranges being largely non-overlapping.

Greater Glider (*Petauroides Volans*) (Vulnerable EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Criteria	**Address of Criteria**
lead to a long-term decrease in the size of an important population of a species	All populations of the Greater Glider (southern) are important for the conservation of the species across its range, because of low fecundity and limited dispersal capabilities, local extinctions are not readily recolonised. At present there are three populations listed in NSW legislation as Endangered, because they are small and isolated from other populations, these are: • Eurobodalla Local Government Area – Listing date 7-09-2007 • Mount Gibraltar Reserve – Listing date 22-05-2015 • Seven Mile Beach National Park – Listing date 16-12-2016 (TSSC 2021). None of these will be impacted by the proposal. The species was not recorded within the study area, however, there are many (70) records for the species in the locality indicating they may occur within the REF proposal area, and the revised proposal area or use it as part of their home range. Closest records to the study area along the plateau are located just to the south of Blackheath and in the Medlow Bath area. There are numerous records about one km to the west of the proposal, however these are located on the western side of the escarpment and thus are likely not part of the same population due to topographic and dispersal limitations up/down the escarpment. Critically, Greater Gliders require hollow-bearing trees for shelter and den sites; potentially requiring multiple hollows. Greater Gliders may be less likely to occur within the REF proposal area or the revised proposal area, compared to the surrounding habitat due to light and noise disturbance from the existing road and railway and urban areas. However, given the large area of similar habitat available within the broader area (the Blue Mountains National Park and Water NSW land) and the number of previous records of the species (which indicate presence within the locality), their presence within the REF proposal area cannot be ruled out. The closest record of the species to the REF proposal area and revised proposal area is to the south of Blackheath. The proposal will require the removal of up to 50.01 ha of native vegetation within the REF proposal area and revised proposal area, including moderate to highly connected woodlands or forest habitat types located next to the existing Great Western Highway. A total of 231 hollow-bearing trees have been recorded within the study area and up to 220 hollow-bearing trees may be directly impacted as they occur within the proposal area. The proposal has the potential to impact the Greater Glider through removal of potential breeding habitat (hollow-bearing trees) and reduction in foraging habitat. Habitat present is of

Greater Glider (*Petauroides Volans*) (Vulnerable EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	variable quality extending 7 km along the linear proposal footprint. Given the size of their home ranges, the area of habitat within the proposal area would likely represent a relatively small portion of habitat for species whose home ranges may overlap the REF proposal area and revised proposal area. Given the large area of similar habitat available within the broader area, the Blue Mountains National Park and Water NSW land, and presence of suitable foraging resources within these areas, species mobility and the removal of a relatively small proportion of woodland habitat within the study area is, the proposal is considered unlikely to have an adverse effect on the foraging resources available to the species. However, the proposal may impact on the life cycle of any individuals that may occur within the REF proposal area and revised proposal area through removal of nesting resources. Mitigation measures to be employed to avoid/mitigate impacts to the Greater Glider (especially breeding habitat) will include: • Avoid clearing of potentially suitable nest trees wherever possible • Time clearing to avoid breeding season (late spring to early autumn) • Pre-clearing surveys of hollow-bearing trees to identify any breeding/nesting individuals and only undertake clearing once young have left. • Installation of suitable compensatory habitat (next boxes) at least six months prior to vegetation clearance (as per the nest box plan). Implementation of the mitigation measures will avoid adverse impacts that may lead to a long-term decrease in the size of the population.
reduce the area of occupancy of an important population	The proposal area is not near the limit of the known species range. The proposal would remove up to 50.01 ha of potential foraging habitat and up to 220 potential nest trees. However, targeted surveys did not find any of the species within the study area. Surveys in the Blue Mountains (Murphy's Glen) have recorded a significant decline in Greater Glider presence between 1986 to 2014, with little species detection from 2010 (TSSC 2016). This decline has been observed in anecdotal reports from the lower Blue Mountains and in BioNet Atlas records for the region (TSSC 2016). Given that the species are arboreal and occupy hollow-bearing trees, these would be considered critical habitat for nesting and shelter. Up to 220 hollow-bearing trees will be directly impacted as they occur within the REF proposal area and revised proposal area. It is unlikely though that these species are limited to the area being impacted due to the presence of the surrounding vegetation. The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement and foraging/shelter resources throughout the region.
fragment an existing important population into two or more populations	Targeted surveys did not find any of the species within the study area. In the Blue Mountains, population declines have been recorded at Murphy's Glen; spotlighting undertaken between 1986 and 2014 shows that the species used to be consistently and regularly detected, but by 2010 were difficult to detect and no longer present. However, spotlighting undertaken in 2015 recorded greater gliders on each of the three occasions (1, 2 and 5 individuals), so numbers may be recovering at Murphy's Glen. Anecdotal reports, including from local ecologists, indicated similar declines elsewhere in the lower Blue Mountains, and the NSW BioNet Atlas confirms a marked drop in records in the region (TSSC 2016). The habitat to be removed is located alongside the existing Great Western Highway, therefore its removal will not result in the isolation of patches of habitat. Movement and connectivity on either side of the existing highway and railway corridor, is provided by adjacent vegetation including the larger area of suitable habitat within the Blue Mountains National Park. There are 70 records of the species in the locality. Many of these records occur on both side of the current highway, along the plateau adjacent to the REF proposal area, in the vicinity of Blackheath and Medlow Bath indicating a likely local population across the REF proposal area. The current highway and rail corridor creates an existing (and long-standing) barrier to terrestrial fauna movement from east to west. The approximate distance between vegetation patches either side of the existing Great Western Highway is approximately 20 to 40 metres. The proposal would result in an increase in the distance between the two areas to a maximum distance of 100 m. In some areas, there are existing obstructions to fauna movement (e.g., rail corridor, fencing and buildings). It is possible that the patches of fauna habitat on the eastern and western side of the highway are already effectively isolated (and have been for some time) due to the existing road, rail line and barriers such as fences. It is likely that resident terrestrial fauna are already habituated to the presence of the road and rail corridor. However, the increase in road width may result in reduced ability for terrestrial fauna to move safely across

Greater Glider (*Petauroides Volans*) (Vulnerable EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	the road to access patches of habitat on either side. As such, the proposal may increase the risk of vehicle interactions and fatalities. However, given the long-standing presence of the existing road and railway line, it is unlikely to significantly effect habitat fragmentation for the species. Fauna mortality monitoring should be conducted to monitor for impacts to the species to determine if mitigation (e.g. installation of glider poles) is required.
adversely affect habitat critical to the survival of a species	The proposal would result in removal of up to 50.01 ha of potential foraging and nesting habitat. However, targeted surveys did not find any of the species within the study area. All the arboreal mammals forage in forest species such as Acacia sp., Banksia sp., Eucalypts and other nectar/pollen providing vegetation. These habitats are present in the low to moderate condition vegetation impacted by the proposal. This habitat contains 231 hollow-bearing trees recorded on site, thickets of vegetation, dead trees and fallen woody debris, that these arboreal mammals are known to shelter in. Hollows specifically are critical habitat for nesting. Up to 220 hollow-bearing trees will be directly impacted as they occur within the REF proposal area and revised proposal area. It is unlikely though that these species are limited to the area being impacted due to the presence of the surrounding vegetation. The large intact patches of Blue Mountains National Park provide extensive areas of habitat facilitating fauna movement throughout the region. The mobility of these species increases the likelihood of vehicle strike as the existing highway width increases, particularly in the warmer seasons. The increased distance between the eastern and western sides of the existing highways (from 20 metres to 100 metres) may result in some degree of obstruction of fauna movement along this portion of the Great Western Highway. Given this, it is considered possible that the proposal without mitigation may have a significant effect on the lifecycle of the population of the arboreal mammals utilising the vegetation within the study area. Given the species was not detected during targeted surveys, and the availability of adjacent habitat, the foraging, shelter and nesting resources within the REF proposal area and revised proposal area are unlikely to represent habitat critical to the survival of the species. No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (TSSC 2021).
disrupt the breeding cycle of an important population	The proposal will remove up to 220 hollow-bearing trees as well as, thickets of vegetation, dead trees and fallen woody debris, that these arboreal mammals require for shelter and breeding. Hollows specifically are critical habitat for nesting. The increased risk of vehicle strike associated with the road widening may impact dispersal and re-colonisation opportunities for the species. Given this, it is considered possible that the proposal without mitigation may have a significant effect on the lifecycle of the population of the arboreal mammals utilising the vegetation within the study area. Implementation of the mitigation and habitat compensation measures detailed above will ensure potential impacts to the breeding cycles of any resident individuals will be minimised and significant impact avoided.
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Up to 50.01 ha of foraging, dispersal and nesting habitat is likely to be impacted by the proposed actions. These vegetation zones are mostly low to moderate condition and are already disturbed by previous clearing activity. The REF proposal area and revised proposal area will remove up to 220 hollow-bearing trees which further impact nesting habitat. Implementation of the mitigation measures detailed above will avoid adverse impacts that may lead to species decline.
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposal is unlikely to result in establishment of invasive species that may be harmful to the Greater Glider. However, there is increasing predation from Powerful Owls (*Ninox strenua*). According to TSSC (2016) Powerful Owl numbers have increased in sites that have had Greater Gliders present. Given the expected loss of up to 220 hollow-bearing trees, predation threats may increase as the species is moving between hollows of greater distances. There is also increasing competition with Sulphur-Crested Cockatoos (*Cacatua galerita*) for hollows, with a notable increase in the Blue Mountains since 1990 (TSSC 2016). This is a potential impact with the reduction of up to 220 hollow-bearing trees in the proposal area increasing competition pressures. Implementation of the mitigation measures (including installation of nest boxes) will minimise the potential for invasive species or interspecific competition that may harm the species.

Greater Glider (*Petauroides Volans*) (Vulnerable EPBC Act)	
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
introduce disease that may cause the species to decline, or	It is unlikely that the proposal may introduce disease that may cause species decline. There are no notable diseases that currently threaten the species, however, the Phytophthora root fungus is known to impact the health of Eucalyptus species, in which Greater Gliders rely upon for foraging, nesting, and shelter (TSSC 2016).
interfere substantially with the recovery of the species.	The proposal impacts are unlikely to substantially interfere with the recovery of the species. Given the lack of records within the study area following targeted survey and extent of the available habitat in the locality, this area of foraging and nesting habitat is not likely to impact the recovery of the species with no important subpopulations recorded. However, hollow-bearing trees are a limiting and essential resource, required by these hollow-dependent species for breeding and shelter and thus will be impacted by the proposal. There are strategies to protect hollow-bearing trees as it is a Key Threatening Process, however hollow-retention is often not species-specific and does not consider occupancy, species requirement, competition and predation in regard to changes to the vegetation structure (TSSC 2016). Currently, there are no official recovery plans for the general population of Greater Gliders. Primary conservation actions and recommendations for the Greater Glider include (TSSC 2016;2021): • Protect and retain hollow-bearing trees, suitable habitat, and habitat connectivity. • Constrain clearing in forests with significant subpopulations, to retain hollow-bearing trees and suitable habitat. • Avoid fragmentation and habitat loss due to development and upgrades of transport corridors. While the proposal constitutes habitat loss due to development of road corridors, as identified in point 3 above, every effort will be made to reduce the area of vegetation clearing, retain hollow-bearing tress and compensate for loss of hollow resources through installation of nest boxes.
Conclusion: Based on the above considerations, the proposal is considered unlikely have a significant impact on a population of the Greater Glider.	

Annexure F

REF proposal area and revised proposal area hollow-bearing tree register

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
1	-33.68536284	150.28824	Tree	*Eucalyptus sieberi*	150	5	2	1	0	0	
2	-33.68525898	150.287834	Tree	*Eucalyptus sieberi*	100	1	0	0	0	0	
3	-33.6856521	150.2885505	Tree	*Eucalyptus sieberi*	50	0	1	0	0	0	
4	-33.68575694	150.2884593	Tree	*Eucalyptus sieberi*	80	0	1	0	0	0	
5	-33.68646129	150.2883655	Tree	*Eucalyptus sieberi*	50	0	2	0	0	0	
6	-33.68641729	150.2884807	Tree	*Eucalyptus sieberi*	200	1	0	1	1	1	
7	-33.68635866	150.2883981	Tree	*Eucalyptus sieberi*	80	1	0	8	8	0	
8	-33.68570533	150.2880425	Tree	*Eucalyptus sieberi*	150	2	1	1	1	0	
9	-33.68570242	150.2878984	Tree	*Eucalyptus sieberi*	80	0	3	0	0	0	
10	-33.68561457	150.2878793	Tree	*Eucalyptus sieberi*	250	2	1	0	0	0	
11	-33.6677163	150.2803481	Tree	*Eucalyptus sieberi*	100	0	2	2	1	0	
12	-33.66780554	150.2803035	Tree	*Eucalyptus sieberi*	60	0	1	0	0	0	
13	-33.66786282	150.2802915	Tree	*Eucalyptus sieberi*	80	1	0	0	0	0	
14	-33.66790393	150.2802286	Tree	*Eucalyptus sieberi*	80	0	2	2	1	0	
15	-33.6680291	150.2801973	Tree	*Eucalyptus sieberi*	90	2	2	2	0	0	

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
16	-33.6676573	150.2805517	Tree	*Eucalyptus sieberi*	90	1	1	0	0	0	
17	-33.6675967	150.2803095	Tree	*Eucalyptus sieberi*	100	0	2	0	0	0	
18	-33.66748623	150.2802873	Tree	*Eucalyptus sieberi*	150	2	2	1	0	0	
19	-33.66737568	150.2804459	Tree	*Eucalyptus sieberi*	80	1	1	0	0	0	
20	-33.66728559	150.2804401	Tree	*Eucalyptus sieberi*	100	1	1	0	0	0	
21	-33.66646379	150.2803334	Tree	*Eucalyptus sieberi*	100	2	2	2	1	1	
22	-33.66633317	150.2803644	Tree	*Eucalyptus sieberi*	80	1	2	0	0	0	
23	-33.66600998	150.2803299	Tree	*Eucalyptus oreades*	150	1	2	0	0	8	
24	-33.66526535	150.2802903	Tree	*Eucalyptus sieberi*	90	1	1	0	0	0	
25	-33.66518751	150.2801382	Tree	*Eucalyptus sieberi*	25	0	1	0	0	0	
26	-33.6649154	150.2799823	Tree	*Eucalyptus sieberi*	100	1	2	0	0	0	
27	-33.61379442	150.2714673	Tree	*Eucalyptus oreades*	180	3	2	1	0	0	
28	-33.61402624	150.2717583	Tree	*Eucalyptus piperita*	100	2	2	0	0	0	
29	-33.61410759	150.2717619	Tree	*Eucalyptus piperita*	90	1	2	0	0	0	
30	-33.61410178	150.2717976	Tree	*Eucalyptus piperita*	130	2	1	0	0	0	

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
31	-33.61419768	150.2720121	Tree	*Eucalyptus piperita*	150	2	1	0	0	0	
32	-33.6143275	150.272141	Tree	*Eucalyptus fastigata*	50	1	1	0	0	0	
33	-33.61454761	150.2721559	Tree	*Eucalyptus fastigata*	200	0	1	1	0	0	
34	-33.61517532	150.2729253	Tree	*Eucalyptus fastigata*	200	2	2	1	0	0	
35	-33.61606834	150.2722303	Tree	*Eucalyptus piperita*	90	2	1	0	0	0	
36	-33.61520234	150.2715762	Tree	*Eucalyptus fastigata*	100	2	1	0	0	0	
37	-33.61525159	150.2715538	Tree	*Eucalyptus fastigata*	10	1	1	0	0	0	
38	-33.59823605	150.2655743	Tree	*Eucalyptus sieberi*	90	1	1	1	0	0	
39	-33.59847697	150.2658534	Tree	*Eucalyptus oreades*	90	2	1	0	0	0	
40	-33.59867698	150.266321	Tree	*Eucalyptus oreades*	90	1	1	0	0	0	
41	-33.64591061	150.2846558	Tree	*Eucalyptus sieberi*	30	0	1	0	0	0	
42	-33.64522708	150.2850501	Tree	*Eucalyptus sieberi*	40	1	1	0	0	0	
43	-33.6977822	150.2891646	Tree	*Eucalyptus oreades*	100	1	0	0	0	0	
44	-33.69775087	150.2891593	Tree	*Eucalyptus oreades*	80	0	2	0	0	0	
45	-33.6984368	150.2908745	Tree	*Eucalyptus piperita*	90	1	1	0	0	0	

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
46	-33.6983947	150.2908405	Stag	*Eucalyptus piperita*	80	2	2	0	0	0	
47	-33.69845018	150.2907707	Tree	*Eucalyptus sieberi*	80	1	2	1	0	0	
48	-33.6985854	150.2907645	Stag	*Eucalyptus sieberi*	60	0	1	0	1	0	
49	-33.6987545	150.2908283	Stag	*Eucalyptus sieberi*	60	2	5	0	0	0	
50	-33.69882647	150.2908277	Stag	*Eucalyptus sieberi*	60	3	2	2	1	0	
51	-33.69930987	150.2905055	Stag	*Eucalyptus sieberi*	50	5	0	0	0	0	
52	-33.68613172	150.2879481	Tree	*Eucalyptus sieberi*	110	1	1	0	1	0	
53	-33.7008978	150.2898069	Tree	*Eucalyptus sieberi*	110	0	1	1	1	0	
54	-33.7010225	150.289814	Tree	*Eucalyptus sieberi*	120	0	1	1	0	0	
55	-33.7011938	150.2899498	Tree	*Eucalyptus sieberi*	50	0	1	0	0	0	
56	-33.6522641	150.285927	Tree	*Eucalyptus sclerophylla*	50	1	0	0	0	0	
57	-33.652327	150.2857	Tree	*Eucalyptus sieberi*	100	3	2	0	0	0	
58	-33.6528829	150.2842262	Tree	*Eucalyptus sieberi*	150	1	1	0	0	0	
59	-33.6530087	150.2842653	Tree	*Eucalyptus sieberi*	120	0	1	0	0	0	
60	-33.65320602	150.2842569	Stag	*Eucalyptus spp.*	25	1	0	0	0	0	

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
61	-33.6689288	150.2801692	Tree	*Eucalyptus viminalis*	100	0	2	0	0	0	
62	-33.66906587	150.2801461	Tree	*Eucalyptus spp.*	200	1	0	1	0	0	
63	-33.66901667	150.2805693	Tree	*Eucalyptus spp.*	150	2	1	0	0	0	
64	-33.70234128	150.2897015	Tree	*Eucalyptus piperita*	40	1	0	0	0	0	
65	-33.6627377	150.2786953	Tree	*Eucalyptus spp.*	80	0	1	2	1	0	
66	-33.70218459	150.2899402	Stag	*Eucalyptus spp.*	90	2	2	0	0	0	
67	-33.6629691	150.2783656	Tree	*Eucalyptus spp.*	50	0	1	0	0	0	
68	-33.70228021	150.290397	Tree	*Eucalyptus spp.*	80	2	1	0	0	0	
69	-33.70245491	150.2904323	Tree	*Eucalyptus sieberi*	120	0	0	2	0	0	
70	-33.70292286	150.290253	Tree	*Eucalyptus spp.*	80	0	3	0	0	0	
71	-33.70307311	150.2903728	Tree	*Eucalyptus spp.*	100	1	1	0	0	0	
72	-33.70312854	150.2904572	Tree	*Eucalyptus viminalis*	100	0	1	1	1	0	
73	-33.70330442	150.2904109	Tree	*Eucalyptus sieberi*	80	2	1	0	0	0	
74	-33.70350215	150.290508	Tree	*Eucalyptus oreades*	150	0	4	1	0	0	
75	-33.70356935	150.2905678	Tree	*Eucalyptus piperita*	80	0	0	2	0	0	

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
76	-33.70348458	150.2905381	Tree	*Eucalyptus piperita*	40	1	0	0	0	0	
77	-33.70273402	150.2904378	Stag	*Eucalyptus spp.*	30	2	0	0	0	0	
78	-33.70175124	150.2902503	Tree	*Eucalyptus piperita*	200	1	5	0	0	0	
79	-33.70144454	150.2900173	Tree	*Eucalyptus piperita*	80	0	1	0	1	0	
80	-33.70121061	150.2897578	Tree	*Eucalyptus piperita*	30	1	0	0	0	0	
81	-33.70113633	150.289641	Tree	*Eucalyptus piperita*	100	1	2	0	0	0	
82	-33.70095708	150.2895903	Tree	*Eucalyptus spp.*	80	2	0	0	0	0	
83	-33.70071964	150.2894994	Tree	*Eucalyptus spp.*	35	2	0	0	0	0	
84	-33.70067092	150.2895169	Tree	*Eucalyptus piperita*	45	1	0	0	0	0	
85	-33.70058478	150.2896436	Tree	*Eucalyptus piperita*	90	1	2	1	1	0	
86	-33.70050317	150.2898758	Stag	*Eucalyptus piperita*	45	2	1	0	0	0	
87	-33.70058493	150.2899071	Stag	*Eucalyptus piperita*	50	3	0	0	0	0	
88	-33.70055799	150.2900648	Tree	*Eucalyptus piperita*	80	1	1	1	0	0	
89	-33.70051044	150.2901089	Tree	*Eucalyptus spp.*	60	0	2	0	0	0	
90	-33.70033853	150.2898297	Tree	*Eucalyptus piperita*	60	0	1	0	0	0	

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
91	-33.70028659	150.2900655	Tree	*Eucalyptus piperita*	100	1	1	0	0	0	
92	-33.65616905	150.2808708	Tree	*Eucalyptus sieberi*	120	1	3	0	8	0	
93	-33.65628162	150.2807826	Tree	*Eucalyptus sieberi*	90	2	0	0	0	0	
94	-33.65640933	150.2807359	Tree	*Eucalyptus sieberi*	90	2	2	0	0	0	
95	-33.65653106	150.2806843	Tree	*Eucalyptus sieberi*	120	1	2	0	0	0	
96	-33.65370531	150.2837201	Stag	*Eucalyptus spp.*	30	1	0	0	0	0	
97	-33.65397124	150.2836988	Tree	*Eucalyptus sieberi*	45	1	2	1	0	0	
98	-33.65389809	150.283816	Stag	*Eucalyptus spp.*	45	2	0	0	0	0	
99	-33.6541682	150.2835992	Stag	*Eucalyptus spp.*	90	3	1	0	0	0	
100	-33.65403741	150.2840956	Stag	*Eucalyptus spp.*	35	2	0	0	0	0	
101	-33.72832138	150.4418426	Stag	*Eucalyptus spp.*	-	-	-	-	-	-	-
102	-33.72845947	150.4418842	Tree	*Eucalyptus spp.*	-	-	-	-	-	-	-
103	-33.72854593	150.4422036	Tree	*Corymbia gummifera*	-	-	-	-	-	-	-
104	-33.72853478	150.4422045	Hollow-bearing tree	*Eucalyptus globoidea*	-	-	-	-	-	-	-
105	-33.72866361	150.4420103	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
106	-33.72871181	150.4420192	Hollow-bearing tree	*Corymbia gummifera*	-	-	-	-	-	-	-
107	-33.66872237	150.2799342	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
108	-33.66572687	150.2801354	Hollow-bearing tree	*Eucalyptus seiberi*	-	-	-	-	-	-	-
109	-33.66460984	150.2792777	Hollow-bearing tree	*E. Sclerophylla*	-	-	-	-	-	-	-
110	-33.66376906	150.2785331	Hollow-bearing tree	*E. Sclerophylla*	-	-	-	-	-	-	-
111	-33.66367195	150.2784513	Hollow-bearing tree	*E. Sclerophylla*	-	-	-	-	-	-	-
112	-33.66356619	150.2782961	Hollow-bearing tree	*E. Sclerophylla*	-	-	-	-	-	-	-
113	-33.66284596	150.2782015	Hollow-bearing tree	*E. Sclerophylla*	-	-	-	-	-	-	-
114	-33.66250355	150.2782253	Hollow-bearing tree	*Eucalyptus*	-	-	-	-	-	-	-
115	-33.66215836	150.2782414	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
116	-33.66165159	150.2785244	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
117	-33.66034029	150.2785971	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
118	-33.65656029	150.2807308	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
119	-33.65292321	150.2841064	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
120	-33.65324327	150.2837788	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
121	-33.65330454	150.283874	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
122	-33.65363218	150.2829148	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
123	-33.65504263	150.2816748	Hollow-bearing tree	*E. Piperita*	-	-	-	-	-	-	-
124	-33.6561708	150.2808601	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
125	-33.65642336	150.2807342	Hollow-bearing tree	*E. Sieberi*	-	-	-	-	-	-	-
126	-33.66732858	150.2804868	Hollow-bearing tree	*E. Sieberi*	-	-	-	-	-	-	-
127	-33.66653529	150.2803723	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
128	-33.66653793	150.2803608	Hollow-bearing tree	*E.sieberi*	-	-	-	-	-	-	-
129	-33.66519891	150.2797243	Hollow-bearing tree	*E.seiberi*	-	-	-	-	-	-	-
130	-33.66879673	150.2801909	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
131	-33.66878636	150.2802909	Hollow-bearing tree	*Eucalyptus radiata*	-	-	-	-	-	-	-
132	-33.66891626	150.2802456	Hollow-bearing tree	*E.radiata*	-	-	-	-	-	-	-
133	-33.6687497	150.2800478	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
134	-33.66879537	150.2800707	Hollow-bearing tree	*E.oreades*	-	-	-	-	-	-	-
135	-33.65919876	150.2830505	Hollow-bearing stag	*Eucalyptus sieberi*	-	-	-	-	-	-	-

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
136	-33.7066468	150.294255	Hollow-bearing stag	*Eucalyptus sieberi*	-	-	-	-	-	-	-
137	-33.683066	150.2855696	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
138	-33.6837877	150.2861932	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
139	-33.6627592	150.2786901	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
140	-33.6629101	150.2786423	Hollow-bearing tree	*Eucalyptus spp.*	-	-	-	-	-	-	-
141	-33.6628873	150.2785368	Hollow-bearing stag	*Eucalyptus oreades*	-	-	-	-	-	-	-
142	-33.6632444	150.2784431	Hollow-bearing tree	*Eucalyptus spp*	-	-	-	-	-	-	-
143	-33.6628869	150.2786882	Hollow-bearing tree	*Eucalyptus spp*	-	-	-	-	-	-	-
144	-33.6628301	150.2788473	Hollow-bearing tree	*Eucalyptus spp.*	100	0	2	2	1	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
145	-33.6677163	150.2803481	Hollow-bearing tree	*Eucalyptus oreades*	150	2	2	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
											minimum height of 9 metres)
146	-33.66748623	150.2802873	Hollow-bearing tree	*Eucalyptus oreades*	100	2	2	2	1	1	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
147	-33.66646379	150.2803334	Hollow-bearing tree	*Eucalyptus oreades*	110	0	1	1	1	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
148	-33.7008978	150.2898069	Hollow-bearing tree	*Eucalyptus oreades*	120	0	1	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
149	-33.7010225	150.289814	Hollow-bearing tree	*Eucalyptus oreades*	200	1	0	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
150	-33.66906587	150.2801461	Hollow-bearing tree	*Eucalyptus oreades*	120	0	0	2	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
151	-33.70245491	150.2904323	Hollow-bearing tree	*Eucalyptus sieberi*	100	0	1	1	1	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
152	-33.70312854	150.2904572	Hollow-bearing tree	*Eucalyptus sieberi*	150	0	4	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
											and with minimum height of 9 metres)
153	-33.70350215	150.290508	Hollow-bearing tree	*Eucalyptus sieberi*	200	0	3	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
154	-33.65770427	150.2803445	Hollow-bearing tree	*Eucalyptus sieberi*	100	0	2	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
155	-33.65449874	150.2824914	Hollow-bearing tree	*Eucalyptus sieberi*	120	0	2	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
156	-33.65459067	150.2819091	Hollow-bearing tree	*Eucalyptus sieberi*	100	0	0	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
157	-33.65513138	150.2819112	Hollow-bearing tree	*Eucalyptus sieberi*	100	1	1	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
158	-33.65878695	150.278945	Hollow-bearing tree	*Eucalyptus sieberi*	100	1	1	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
159	-33.66072483	150.2785844	Hollow-bearing tree	*Eucalyptus sieberi*	2	0	0	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
											and with minimum height of 9 metres)
160	-33.65500537	150.2822382	Hollow-bearing tree	*Eucalyptus oreades*	3	0	0	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
161	-33.65506245	150.2822264	Hollow-bearing tree	*Eucalyptus oreades*	5	0	0	1	0	0	Suitable Cockatoo nest tree (as defined in the BAM, hollow > 10 cm diameter and with minimum height of 9 metres)
162	-33.6584123	150.279454	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
163	-33.66872237	150.2799342	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
164	-33.66572687	150.2801354	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
165	-33.66460984	150.2792777	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
166	-33.66376906	150.2785331	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
167	-33.66367195	150.2784513	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
168	-33.66356619	150.2782961	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
169	-33.66284596	150.2782015	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
170	-33.66250355	150.2782253	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
171	-33.66215836	150.2782414	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
172	-33.66165159	150.2785244	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
173	-33.66034029	150.2785971	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
174	-33.65656029	150.2807308	Hollow-bearing tree	*Eucalyptus oreades*	-	-	-	-	-	-	-
175	-33.65292321	150.2841064	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
176	-33.65324327	150.2837788	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
177	-33.65330454	150.283874	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
178	-33.65363218	150.2829148	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
179	-33.65504263	150.2816748	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
180	-33.6561708	150.2808601	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
181	-33.65642336	150.2807342	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
182	-33.66732858	150.2804868	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
183	-33.66653529	150.2803723	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
184	-33.66653793	150.2803608	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
185	-33.66519891	150.2797243	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
186	-33.66879673	150.2801909	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
187	-33.66878636	150.2802909	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
188	-33.66891626	150.2802456	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
189	-33.6687497	150.2800478	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
190	-33.66879537	150.2800707	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
191	-33.65919876	150.2830505	Hollow-bearing stag	*Eucalyptus sieberi*	-	-	-	-	-	-	-
192	-33.7066468	150.294255	Hollow-bearing stag	*Eucalyptus sieberi*	-	-	-	-	-	-	-
193	-33.683066	150.2855696	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
194	-33.6837877	150.2861932	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
195	-33.6627592	150.2786901	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
196	-33.6629101	150.2786423	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
197	-33.6628873	150.2785368	Hollow-bearing stag	*Eucalyptus sieberi*	-	-	-	-	-	-	-
198	-33.6632444	150.2784431	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
199	-33.6628869	150.2786882	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
200	-33.6628301	150.2788473	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
201	-33.65343505	150.284071	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
202	-33.65495262	150.2821975	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
203	-33.65500537	150.2822382	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
204	-33.65506245	150.2822264	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
205	-33.6584123	150.279454	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
206	-33.65872388	150.2793455	Hollow-bearing tree	*Eucalyptus sieberi*	-	-	-	-	-	-	-
207	-33.69212988	150.29036654	Hollow-bearing tree	*Eucalyptus sclerophylla*	40	0	1	0	0	0	In fork 5 metres from the ground.
208	-33.6592	150.2831	Hollow-bearing stag	*Eucalyptus sieberi*	35	0	0	1	1	0	-
209	-33.6534	150.2841	Hollow-bearing tree	*Eucalyptus piperita*	40	0	1	0	0	0	-

HBT No.	Latitude	Longitude	Type	Species	DBH	Hollows 5cm	Hollows 5 - 10 cm	Hollows 11-20cm	Hollows 21-30cm	Hollows 30cm	Notes
210	-33.655	150.2822	Hollow-bearing tree	*Eucalyptus sieberi*	20	1	1	0	0	0	-
211	-33.655	150.2822	Hollow-bearing tree	*Eucalyptus sieberi*	30	1	0	0	0	0	-
212	-33.6551	150.2822	Hollow-bearing tree	*Eucalyptus sieberi*	75	1	0	0	0	0	-
213	-33.6584	150.2795	Hollow-bearing tree	*Eucalyptus oreades*	80	0	1	0	0	0	-
214	-33.6587	150.2793	Hollow-bearing tree	*Eucalyptus sieberi*	80	1	0	0	0	0	-
215	-33.6527	150.2844	Hollow-bearing tree	*Eucalyptus sieberi*	70	0	0	1	1	0	-
216	-33.6523	150.2857	Hollow-bearing tree	*Eucalyptus sieberi*	65	1	0	0	0	0	-
217	-33.6527	150.2843	Hollow-bearing tree	*Eucalyptus oreades*	90	1	0	0	0	0	-
218	-33.6521	150.2859	Hollow-bearing tree	*Eucalyptus sieberi*	70	1	0	0	0	0	-
219	-33.6551	150.2881	Hollow-bearing tree	*Eucalyptus sieberi*	55	1	0	0	0	0	-
220	-33.6503	150.2854	Hollow-bearing tree	*Eucalyptus sieberi*	40	1	0	0	0	0	-

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