Flora and Fauna Impact Assessment

Lot 1 DP436706
Lot B DP357731
Lot 26 Section 6 DP1591

7 – 11 Bent Street
Gosford
Gosford LGA

For: KDC Administrative services 2 Pty Ltd

REF: GCC 15-778
December 2015

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Cover photograph: View of the sloping APZ up toward Henry Parry Drive.

Photo: A.McTackett, 19th November 2015

SUMMARY

This flora and fauna impact assessment has considered the likely impacts of the proposed development at 7 – 11 Bent Street, Gosford in the Gosford Local Government Area upon the threatened fauna likely to use the site.

It is proposed to construct a multi storey residential unit complex above a retail and commercial outlet with basement car parking within the grounds of Lot 1 DP436706, Lot B DP357731 and Lot 26 Section 6 DP1591, 7 – 11 Bent Street, Gosford. This will require the modification of approximately 1,985 square metres of vegetation, including the removal of some trees that are scattered in and around the proposed works in the existing residential lots and in the area of vegetation immediately to the east that is to be incorporated into an APZ.

The vegetation on site is unmanaged and overrun with exotic weeds. Natural vegetation in this area is Narrabeen Coastal Blackbutt Forest, which is not an endangered ecological community, although regarded as Regionally Significant Vegetation within the Gosford LGA. Vegetation in the study area may provide foraging resources for many fauna species, particularly given the proximity to Rumbalara Reserve to the east of Henry Parry Drive. However, Henry Parry Drive would represent a major barrier for the movement of all but highly mobile species such as birds and bats.

Three of the trees within the APZ contain small hollows suitable for microbats and small birds. One of these trees (a dead tree) will need to be removed.

The threatened fauna species known from the local area that are likely to use the site's habitat features include:

- *Calyptorhynchus lathami* Glossy Black-Cockatoo
- *Glossopsitta pusilla* Little Lorikeet
- *Ninox strenua* Powerful Owl
- *Mormopterus norfolkensis* Eastern Freetail-bat
- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat
- *Miniopterus australis* Little Bentwing-bat
- *Myotis Macropus* Large-footed Myotis
- *Falsistrellus tasmaniensis* Eastern False Pipistrelle

The loss of fauna habitat and foraging resources are to be ameliorated and offset by retention of vegetation and native plantings within islands in the area of APZ and the installation of nest boxes. Native plantings within the landscaped parts of the development are to be informed by the native species known to occur naturally in Narrabeen Coastal Blackbutt Forest as listed by Bell (2009b). These species should also be chosen according to their fire retardant values.

For each hollow to be removed, it is recommended that at least 1 nest box is installed for each of the fauna groups likely to use that hollow, including microbats, small parrots and possums. These must be installed under ecological supervision, regularly checked and replaced / repaired as required for the life of the development. Further, in order to protect resident fauna, the hollow-bearing tree must be removed under ecological supervision.

In order to minimise ecological impact in the APZ, it is to be implemented after on-site consultation between the bushfire consultant and project ecologist so that priority trees and native vegetation islands may be retained. Subsequent management of the APZ is to protect these retained areas.

The assessment of likely impact under the New South Wales TSC Act (1995) concluded that a significant impact is not likely to occur upon any state listed threatened species, populations or endangered ecological communities or their habitats due to the small scale changes proposed. Therefore a Species Impact Statement is not recommended to be prepared for the proposal.

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1 INTRODUCTION

1.1 Background

Keystone Ecological has been contracted by Simone Khiralla of KDC Administrative services 2 Pty Ltd to prepare an assessment of the likely impact of a proposed development upon matters of conservation significance. It is proposed to construct a multi storey residential unit complex above a retail and commercial outlet with basement car parking at 7 – 11 Bent street, Gosford in the Gosford Local Government Area (LGA).

1.2 The Site and the Proposal

The subject site is located at Lot 1 DP436706, Lot B DP357731 Lot 26 Section 6 DP1591, 7 – 11 Bent Street, Gosford in the Gosford Local Government Area (LGA). It lies in the Sydney Basin Bioregion in the Hunter Central Rivers Catchment Area and the centre of the site is approximately at grid reference 346108 E 6300640 N MGA on the Gosford 1:25,000 topographic map sheet.

The location of the site is shown in Figure 1. The distribution of vegetation and development in the local area is shown in Figure 2 with a closer aerial view at Figure 3. The site is illustrated in Photographs 1 – 10.

The subject site is made up of 3 residential blocks and associated adjacent vegetation that is to be managed as part of an Asset Protection Zone (APZ). The 3 lots occupy a total area of approximately 1,790 square metres and together are rectangular in shape. The site has a west facing aspect and is situated approximately at the midslope. On the eastern side of the residential lots is a narrow vegetated area, dividing Bent Street from Henry Parry Drive. This is the area that is to be a part of the proposed Asset Protection Zone (APZ) and occupies an area of 1,210 square metres.

The site is bound by residential development to the north, south and west and Henry Parry Drive immediately to the east, with Rumbalara Reserve occurring on the other side of Henry Parry Drive.

Two of the residential lots are already developed, with a small fibro house at 7 Bent Street and a two storey unit block with undercover parking at 9 Bent Street. Number 11 is vacant and covered in weeds. There are a few trees, both native and exotic, principally around the edges. The APZ works within the adjacent patch of vegetation to the east is the major focus of this impact assessment.

The site is highly disturbed with no apparent maintenance of the grounds. The vegetation of the APZ is highly modified, with weeds dominant in the understorey. Concealed in the adjacent bushland are itinerant camps. There is also much dumping in evidence, with domestic debris, discarded needles and a burnt-out car.

The existing plan of the site with the vegetation to be assessed is shown in Figure 3.

The proposal is to:

- Construct a multi storey unit complex above retail and commercial outlets;
- Construct basement car parking for units and retail outlets; and
- Construct a turning head at the top of Bent street.

The works will include the demolition of the existing residential development, removal of vegetation from the subject site and within the area of the turning head and management of the vegetation immediately to the east of the site for the APZ.

The layout of the proposal is shown in Figure 4.

1.3 Legislative Context and Slope

1.3.1 Regional / Local Legislation

For the Gosford LGA, regionally significant ecological issues are discussed in the Flora and Fauna Survey Guidelines: Lower Hunter Central Coast Region 2002 (Murray et al. 2002).

According to Murray et al. (2002), flora and fauna surveys and assessments are to address each of the following:

1 likely impacts on species of regional significance identified;
2 likely impacts on vegetation communities within the Lower Hunter Central Coast Region that have been heavily cleared;
3 likely impacts on vegetation communities within the Lower Hunter Central Coast Region that are less than 1000 hectares in extent;
4 likely impacts on habitat corridors identified in Local Environmental Plans, Development Control Plans or other policies or plans that have been adopted by the relevant local council;
5 likely impact on rainforest vegetation, riparian vegetation, and coastal wetlands if present; and
6 the contents of any policies or plans that have been adopted by the relevant local council relating to specific species or areas.

The guidelines state that the significance of impacts should be assessed in a manner analogous to that required for a Section 5A Assessment.

Bell (2009a, 2009b) also identified the conservation significance of vegetation communities within the Gosford Local Government Area. Consideration has also been given within this report to this significant flora so identified.

1.3.2 Review of Relevant Past Studies

A literature review was carried out. Of particular importance were records of species or matters of conservation significance. This background information informed the field survey and impact assessment.

Soil Landscapes of the Gosford – Lake Macquarie 1:100,000 sheet (Murphy 1993)

Soil landscapes are a good predictor of vegetation types and therefore of threatened species habitat.

The subject site has been mapped as wholly within the Erina soil landscape with Watagan soil landscape to the east at Rumbalara Reserve. Their distribution is illustrated in Figure 5.

The **Erina** soil landscape is an erosional soil landscape occurring on undulating to rolling rises on the Terrigal formation of the Narrabeen Group. Occurs in areas where the local relief is less than 60 metres with slopes and gradients less than 25%. It is extensively cleared tall open-forest with open heathland in coastal exposed areas.

Common vegetation on this soil landscape in tall open-forests includes *Eucalyptus pilularis* Blackbutt, *Allocasuarina torulosa* Forest Oak, *Syncarpia glomulifera* Turpentine, *Eucalyptus maculata* Spotted Gum, *Angophora costata* Smooth-barked Apple, *Eucalyptus paniculata* Grey Ironbark and *Eucalyptus saligna* Sydney Blue Gum. Heathlands on this soil landscape contain *Banksia integrifolia* Coastal Banksia, *Allocasuarina littoralis* Black She-oak, *Westringia fruticosa* Native Rosemary and *Acacia longifolia* Sydney Golden Wattle.

The Natural Vegetation of the Gosford Local Government Area, Central Coast, New South Wales Part 1 Technical Report (Bell 2009a) and the Natural Vegetation of the Gosford Local Government Area, Central Coast, New South Wales Part 2 Vegetation Community Profiles (Bell 2009b)

This mapping shows the subject site as being unclassified with the area of APZ to the east mapped as E22ai Narrabeen Coastal Blackbutt Forest. This area is mapped as being Regionally Significant vegetation and extends north east along Henry Parry Drive and into Rumbalara Reserve.

The relevant extract of this mapping is provided in Figure 6.

Map Unit E22ai Narrabeen Coastal Blackbutt Forest is dominated by *Eucalyptus pilularis* Blackbutt, *Syncarpia glomulifera* Turpentine and *Allocasuarina torulosa* Forest Oak. In undisturbed bushland, it has a shrubby understorey of *Acacia longifolia*, *Duboisia myoporoides*, *Leucopogon margarodes*, *Gompholobium latifolium*, *Bossiaea obcordata*, *Hibbertia aspera*, *Lomandra obliqua*, *Xanthorrhoea macronema* and *Pteridium esculentum*. The type variant E22ai has a sparse to moderate understorey of shrubs and a well-developed grass layer.

No species of conservation significance are known from this vegetation type.

2 BIODIVERSITY

The biodiversity of the site and surrounds need to be considered when assessing the potential impact of the proposal. As well as site inspections, the assessment process is informed by interrogation of biodiversity databases and the scientific literature.

2.1 Survey methods

Prior to the detailed survey of the subject site, and in addition to the literature review as described in Section 1 above, the following was carried out:

1 Colour aerial photography was interpreted prior to field survey to delineate preliminary vegetation community boundaries and areas of disturbance on site.
2 A search of the EPBC Act (1999) database using the Protected Matters Search Tool (www.environment.gov.au/erin/ert/epbc/index.html) on the Department of the Environment website was completed. The search area was confined to a 10 kilometre radius of the site. This identified species of conservation significance under the EPBC Act (1999) that may require habitat assessment or targeted survey.
3 The online component of the OEH Wildlife Atlas (http://www.bionet.nsw.gov.au/) was interrogated for an area confined to a 10 kilometre radius of the site. This search provided records of species of threatened flora within the locality.
4 PlantNet, the online database of the National Herbarium of NSW at the Royal Botanic Gardens was also interrogated (http://plantnet.rbgsyd.nsw.gov.au/floraonline.htm) for rare or threatened species that have been recorded in the locality.
5 The Atlas of Living Australia (http://www.ala.org.au/) was interrogated for all threatened plant species recorded within 10 kilometres of the subject site. As well as records held by PlantNet and the OEH Wildlife Atlas, this online database also contains records from other institutions (such as State Forests of NSW) that may not otherwise be displayed.

A site inspection was undertaken on the 19th November 2015 and included:

- Confirmation of the location and identity of tree species within the proposed works area and APZ management zone;
- Assessment of flora on site and in the APZ management zone, particularly considering threatened flora species known to occur in the local area;
- Assessment of available habitats for locally-occurring fauna species, particularly considering threatened fauna species known to occur in the local area.

Flora specimens were collected for later identification of plants not readily identifiable in the field. Such specimens were identified according to Harden (1990, 1991, 1992, 1993) and the interactive flora (Flora Online) provided online by NSW National Herbarium of the Royal Botanic Gardens (http://plantnet.rbgsyd.nsw.gov.au/floraonline.htm).

Fauna survey was principally restricted to habitat assessment, diurnal bird survey, reptile survey and recording and identification of microbats.

2.2 Survey Limitations

2.2.1 Flora Survey Limitations

However, all surveys have inherent limitations as they can only ever represent a sample in time and place of the site's flora. Besides the unavoidable sampling bias to the area actually surveyed, in this instance, the results of survey may also be constrained by recent rainfall and season of survey.

Although the region is currently experiencing a wet La Nina period, over the last 10 years, rainfall statistics from the Gosford weather station show that the area has experienced below average rainfall as well as a change in the pattern of rain from summer-dominant rains towards a Mediterranean climate of winter rainfall. This pattern has been particularly pronounced in the last several years, with the autumn-winter rains falling in significant storm events, such as in June 2007.

The influence of this shifting weather pattern on native plant species is yet to be determined, but it is likely that those species that rely on summer rains or a dry winter will have their life cycles affected.

The season of survey also influences the plant species that may be detected: many grasses, for example, can only be identified when they are flowering and fruiting; many orchids can only be detected when they are flowering.

However, for the flora species of interest for this site, the season and method of survey were appropriate.

2.2.2 Fauna Survey Limitations

Some survey techniques were not used due to the limited habitats available and the level of human activity on site. Techniques that involve the leaving of equipment for extended periods (such as traps or infra-red cameras) were particularly not used. These techniques also target small to medium-sized mammals such as Bandicoots, Potoroos and Quolls.

It is an acknowledged limitation that, no matter how much effort or expertise is employed, not all species that use a site will be recorded during ecological survey. For many fauna species, this is due to their mobility, cryptic nature and unpredictable movement throughout their habitat. In addition, migratory species may be present on the site at some times of the year, and absent at others. In addition to ecological reasons, environmental factors (such as weather, drought and bushfire) may impact on the type and number of species recorded within a site at any one time.

In order to overcome these survey limitations, this report includes a detailed assessment of the habitat present on the site. This habitat analysis is then compared to the results of database searches for threatened species occurring within a 10 kilometre radius of the site. This comparison allows for the prediction of potential use of the site by species of conservation

significance. Any threatened species (flora or fauna) considered to have potential habitat within the site is then made subject to a Section 5A Assessment of Significance. This process ensures that all threatened species with potential to use the site are considered in the impact assessment, rather than only those that were recorded during survey.

2.3 Survey Results

2.3.1 Floristic Composition

A total of 39 native (55%) and 32 exotic (45%) flora species were identified on site and within the area of APZ. A species list is provided in Table 1.1. in Appendix 1.

These 71 species are representative of 35 families, with the dominant families being Poaceae (16 species), Asteraceae (7 species), Fabaceae (6 species) and Myrtaceae (4 species).

The site contains a number of important weeds, including state-listed Noxious Weeds.

- *Asparagus aethiopicus* Ground Asparagus – Class 4 locally controlled weed. Control requirements: The plant must not be sold, propagated or knowingly distributed.
- *Ageratina adenophorum* Crofton weed – Class 4 locally controlled weed. Control requirements: The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.
- *Rubus fruticosis* sp. aggregate Blackberry – Class 4 locally controlled weed. Control requirements: The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed

Asparagus aethiopicus Ground asparagus, *Rubus fruticosis* sp. *aggregate* Blackberry and *Lantana camara* Lantana are classified as Weeds of National Significance.

Asparagus aethiopicus Ground asparagus and *Bidens pilosa* Cobbler's pegs were the most prominent weeds, being scattered over the works area and the APZ.

No flora species of conservation significance were recorded during survey.

2.3.2 Vegetation Types

Interpretation of aerial photography shows the site as supporting modified exotic vegetation in the works area and E22ai Narrabeen Coastal Blackbutt Forest in the area of APZ. This is in accordance with Council's vegetation mapping (Bell 2009a, 2009b) (Figure 6).

2.3.3 Flora Species of Listed Conservation Significance

Results from the Protected Matters Search Tool and the OEH Wildlife Atlas online database searches revealed a number of listed species that require consideration as part of this assessment. Their habitat requirements are explored in Table 1.2 in Appendix 1.

Of these species, all were assessed to have a low likelihood of occurrence on the subject site. None of these species were found on site during floristic survey.

2.3.4 Vegetation Communities of Listed Conservation Significance

A number of Vegetation Communities of Regional Significance have been listed by Murray et al. (2002) and Bell (2009a, 2009b). These have been defined using similar criteria as adopted in the TSC Act (1995), the EPBC Act (1999) and other national objectives and targets for biodiversity conservation (Environment Australia 2001).

The regionally significant vegetation communities in the Gosford LGA are shown on the mapping pages of the Council's website (https://maps.gosford.nsw.gov.au/). All patches of Narrabeen Coastal Blackbutt Forest are delineated as Regionally Significant Vegetation.

2.4 Fauna Survey Results

The subject site supports few native species with the following recorded during surveys:

- *Lampropholis delicata* Garden Skink
- *Alectura lathami* Australian Brush-turkey
- *Trichoglossus haematodus* Rainbow Lorikeet
- *Anthochaera carunculata* Red Wattlebird
- *Chalinolobus gouldii* Gould's Wattle Bat

Ptilonorhynchus violaceus Satin Bowerbird was heard during fauna survey to the north of the APZ area.

No fauna species of conservation significance were recorded during survey.

Fauna habitats are few, given the highly modified nature of the site. However, three of the subject trees were observed to contain hollows:

- A dead tree in the centre of the APZ area contained small cracks within the trunk;
- An *Angophora floribunda* along the footpath of Henry Parry Drive contains a potential small upward facing hollow with a small crack in a branch; and
- One small hollow was observed in a large leaning *Eucalyptus pilularis* Blackbutt along the footpath of Henry Parry Drive.

All of the small hollows identified are suitable for microchiropteran bats.

Other fauna habitat features provided by the trees in and around the works area includes foraging resources: fruits and pollen of the blossom of the tree canopies (available through all seasons) and insects of the tree canopies.

Analysis of the threatened fauna species known to occur in the local area, their habitat requirements, the habitats of the site are provided in Table 1.3 in Appendix 1. The analysis of the site identified a total of 8 fauna species of conservation significance to have a high likelihood to occur on site.

- *Calyptorhynchus lathami* Glossy Black-Cockatoo
- *Glossopsitta pusilla* Little Lorikeet
- *Ninox strenua* Powerful Owl
- *Mormopterus norfolkensis* Eastern Freetail-bat
- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat
- *Miniopterus australis* Little Bentwing-bat
- *Myotis Macropus* Large-footed Myotis
- *Falsistrellus tasmaniensis* Eastern False Pipistrelle

3 IMPACT AND AMELIORATION

A general principle of environmental management is to, in order of preference:

1. Avoid the impacts;
2. Minimise the impacts;
3. Mitigate the impacts; and
4. Compensate for residual impacts once all of the above options have been exhausted.

The proposal will require the modification of approximately 1,985 square metres of woody vegetation, including the removal of some trees within the subject site, the removal of trees and understorey in the turning circle and the removal of dense understorey vegetation and some canopy trees in the APZ for bushfire management.

To minimise soil erosion, at least 75% ground cover should be retained as described in the RFS document Standards for Asset Protection Zones. In areas to be maintained permanently as APZs, a suitable groundcover (e.g. short grass cover) is to be established (NSWRFS, 2006).

The potential impacts will be mitigated by the maximum retention of vegetation as allowed under bushfire rules. To maintain ecological connectivity, islands of native vegetation are to be retained within the APZ. This is achieved by restricting the removal of native vegetation and by relocating native understorey species that are characteristic of Narrabeen Coastal Blackbutt Forest (e.g. *Themeda australis* Kangaroo grass) to replace weed species within those islands.

To determine the locations and quantities of native vegetation islands within the APZ, a site meeting is to be held **prior to works** between the bushfire consultant and project ecologist. Preliminary locations are shown in Figure 4 and have been determined by ecological considerations.

The impact of the loss of potential fauna habitats will occur through the removal of foraging resources on site and within the APZ. The retention of foraging resources within the canopy trees to remain and the understorey islands will ameliorate this impact. Landscape plantings within the development will also serve to mitigate the losses and therefore it is recommended that all plantings are of species relevant to the native vegetation on site.

Three hollow-bearing trees occur within the APZ and one of these (a dead tree) will need to be removed for reasons of safety. It is recommended that the loss of tree hollow is to be replaced by the installation of nest boxes appropriate for microbats, small parrots and possums in retained trees at a ratio of 1 nest box for each hollow lost.

4 IMPACT ASSESSMENT

4.1 Background to the Seven Part Test

Section 5A of the EPA Act (1979) requires that the consent authority take into account seven factors when deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats. If a significant impact is judged likely to occur, a Species Impact Statement (SIS) is required.

In most instances, the consent authority is Council. In certain circumstances, where a higher level assessment is triggered, concurrence from the Office of Environment and Heritage may be required.

Some terms require definition for the assessment and departmental guidelines have been used (*Threatened Species Assessment Guidelines – the assessment of significance* DECC 2007):

- The "subject site" is defined as the area directly affected by the proposal.
- The "study area" is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area extends as far as is necessary to take all potential impacts into account.
- The "local occurrence" of a community is that which occurs in the study area or beyond to include those areas where the movement of individuals and genetic exchange can be demonstrated
- The "risk of extinction" is the likelihood that the local occurrence of the community will become extinct in either the short or long term as a result of direct or indirect impacts arising from the proposal.
- The "composition" of the community includes both plant and animal species as well as its physical structure.

For the threatened species of interest recorded within 10 kilometres of the subject site, (see Tables 1.2 and 1.3 in Appendix 1), the likelihood of occurrence of each species in or near the subject site was determined by analysis of their habitat requirements, the habitats on site and the nature and extent of adjacent habitats.

Each species has been assigned to one of four groups according to their likelihood of occurring on the subject site or within adjacent habitats likely to be impacted by the proposed works:

- ***High likelihood to occur*** - species whose preferred habitat features occur on the site and / or have been recorded close by in similar habitat, and / or are able to reach the subject site from other known and confirmed locations;
- ***Moderate likelihood to occur*** - species whose preferred habitat features in a strict sense occur on or near to the site but are considered generally unlikely to occur. This may be due to such things as the nature of habitats and disturbances between confirmed locations and the subject site, movement patterns of the subject species, the extensive and common

nature of the available habitat in the local area, the rarity of the species, the length of time since it was last recorded and / or the size of its home range;

- ***Low likelihood to occur*** - species with specific terrestrial niches and habitat requirements that generally do not occur on or near the subject site or species that have not been found the area for a considerable period of time; and
- ***No likelihood to occur*** - these are generally aquatic or marine species.

The potential impact on the threatened fauna likely to occasionally occur on site have been assessed by a series of seven part tests. Summaries are provided below and in full in Appendix 2.

4.2 *Calyptorhynchus lathami* Glossy Black-Cockatoo

This species was not recorded on the subject site during survey. It is known from 125 records in the broader study area. The latest record of this species dates from 2014, when an individual was observed approximately 5 kilometres north west in Somersby. This record was also the closest record. This species is highly mobile and therefore the subject site is likely to occur within the home range of animals recorded nearby.

The subject site provides potential foraging habitat for this species with *Allocasuarina* species spread over the area of the Asset Protection Zone. The dense patches of *Allocasuarina* will need to be thinned in the APZ. This represents a loss of **potential** foraging resources.. The majority of the Narrabeen Coastal Blackbutt Forest on site will be managed for conservation under an approved Vegetation Management Plan. This, together with the expanse of connected bushland of Rumbalara reserve to the east, will offset any loss of potential foraging habitat within the APZ.

The proposal is unlikely to have a significant impact on this threatened species.

4.3 *Glossopsitta pusilla* Little Lorikeet

This species was not recorded on the subject site during survey. It is known from 21 records in the broader study area. The latest record of this species dates from 2008, when an individual was recorded approximately 6 kilometres north west in Somersby. The closest record dates from 2007 with a sighting recorded 3 kilometres north west in Wakara Road Reserve. This species is highly mobile and partially nomadic, therefore the subject site is likely to occur within the home range of animals recorded nearby.

The subject site provides potential foraging habitat for this species. The loss of some foraging resources within the APZ will be offset by the retention and conservation management of the majority of the Narrabeen Coastal Blackbutt Forest.

The proposal is unlikely to have a significant impact on this threatened species.

4.4 *Ninox strenua* Powerful Owl

This species was not recorded on the subject site during survey. It is known from 149 records in the broader study area. The latest record of this species dates from 2015, when an individual was

recorded approximately 4 kilometres north east in Rumbalara Reserve. The closest record dates from 2013 with a recording 1 kilometre south in Gosford. This species is highly mobile and therefore the subject site is likely to occur within the home range of animals recorded nearby.

This species is well adapted to metropolitan habitats, as long as critical features of its habitat remain available, being deep gullies with large hollow-bearing trees for breeding, dense vegetation along gullies for roosting and sufficient prey. The site and surrounds will retain these features with the site not containing these critical features.

The proposal is unlikely to have a significant impact on this threatened species.

4.5 *Mormopterus norfolkensis Eastern Freetail-bat*

This species was not recorded on the subject site during survey. It is known from 33 records in the broader study area. The latest record of this species dates from 2015, when an individual was recorded 7km east in Erina Heights. The closest record dates from 2008 with this species recorded 2 kilometres north in Narara.

A single dead hollow-bearing tree will be removed however roosting habitat on site will remain with 2 tree hollows remaining. The area of potential habitat to be managed within the APZ is very small in respect to the area of suitable habitat that is available locally and regionally to this highly mobile species. The small increase in fragmentation of habitat will not impede its movements.

The proposal is unlikely to have a significant impact on this threatened species.

4.6 *Miniopterus orianae oceanensis* Eastern Bent-wing Bat

This species was not recorded on the subject site during survey. It is known from 97 records in the broader study area. The latest record of this species dates from 2015, when it was recorded 6 kilometre west in Somersby. The closest record dates from 1994 with this species recorded less than 1 kilometre south in Gosford.

Foraging habitat for this species occurs above the tree canopy or low over open ground; suitable foraging habitat occurs across the entire site. The site provides potential foraging habitat with the vegetation of the APZ and the bare ground at the rear of the site.

The potential foraging habitat to be removed or disturbed would represent a very small proportion of what is available locally and regionally as this species is highly mobile, able to exploit widely separated resources.

The proposal is unlikely to have a significant impact on this threatened species.

4.7 *Miniopterus australis* Little Bentwing-bat

This species was not recorded on the subject site during survey. It is known from 93 records in

the broader study area. The latest record of this species dates from 2015, when an individual was recorded approximately 6 kilometres west in Somersby. The closest record dates from 2013 with this species recorded 1 kilometre west at President Hill.

Foraging habitat for this species occurs above the tree canopy or low over open ground; suitable foraging habitat occurs across the entire site. The site provides potential foraging habitat with the vegetation of the APZ and the bare ground at the rear of the site.

The potential foraging habitat to be removed or disturbed would represent a very small proportion of what is available locally and regionally as this species is highly mobile, able to exploit widely separated resources.

The proposal is unlikely to have a significant impact on this threatened species.

4.8 *Myotis macropus Large-footed Myotis*

This species was not recorded on the subject site during survey. It is known from 20 records in the broader study area. The latest record of this species dates from 2015, when an individual was recorded approximately 6km west in Somersby The closest record dates from 2001 with this species recorded 2km south in Gosford.

The subject site provides potential roosting habitat for this species. only 1 dead hollow bearing tree will be removed, ensuring the roosting potential on site remains.

The proposal is unlikely to have a significant impact on this threatened species.

4.9 *Falsistrellus tasmaniensis* Eastern False Pipistrelle

This species was not recorded on the subject site during survey. It is known from 28 records in the broader study area. The latest record of this species dates from 2010, when an individual was recorded approximately 7km east in Erina Heights. The closest record dates from 2000 with this species recorded 3km north east in Rumbalara Reserve.

The subject site provides potential roosting and foraging habitat for this species. only 1 dead hollow bearing tree will be removed, ensuring the roosting potential on site remains. The loss of some foraging resources in the APZ is of a very small scale for such a highly mobile species.

The proposal is unlikely to have a significant impact on this threatened species.

5 CONCLUSIONS AND RECOMMENDATIONS

This flora and fauna impact assessment has considered the likely impacts of the proposed development at 7 – 11 Bent Street, Gosford in the Gosford Local Government Area upon the threatened fauna likely to use the site.

It is proposed to construct a multi storey residential unit complex above a retail and commercial outlet with basement car parking within the grounds of Lot 1 DP436706, Lot B DP357731 and Lot 26 Section 6 DP1591, 7 – 11 Bent Street, Gosford. This will require the modification of approximately 1,985 square metres of vegetation, including the removal of some trees that are scattered in and around the proposed works in the existing residential lots and in the area of vegetation immediately to the east that is to be incorporated into an APZ.

The vegetation on site is unmanaged and overrun with exotic weeds. Natural vegetation in this area is Narrabeen Coastal Blackbutt Forest, which is not an endangered ecological community, although regarded as Regionally Significant Vegetation within the Gosford LGA. Vegetation in the study area may provide foraging resources for many fauna species, particularly given the proximity to Rumbalara Reserve to the east of Henry Parry Drive. However, Henry Parry Drive would represent a major barrier for the movement of all but highly mobile species such as birds and bats.

Three of the trees within the APZ contain small hollows suitable for microbats and small birds. One of these trees (a dead tree) will need to be removed.

The threatened fauna species known from the local area that are likely to use the site's habitat features include:

- *Calyptorhynchus lathami* Glossy Black-Cockatoo
- *Glossopsitta pusilla* Little Lorikeet
- *Ninox strenua* Powerful Owl
- *Mormopterus norfolkensis* Eastern Freetail-bat
- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat
- *Miniopterus australis* Little Bentwing-bat
- *Myotis Macropus* Large-footed Myotis
- *Falsistrellus tasmaniensis* Eastern False Pipistrelle

The loss of fauna habitat and foraging resources are to be ameliorated and offset by retention of vegetation and native plantings within islands in the area of APZ and the installation of nest boxes. Native plantings within the landscaped parts of the development are to be informed by the native species known to occur naturally in Narrabeen Coastal Blackbutt Forest as listed by Bell (2009b). These species should also be chosen according to their fire retardant values.

For each hollow to be removed, it is recommended that at least 1 nest box is installed for each of the fauna groups likely to use that hollow, including microbats, small parrots and possums. These must be installed under ecological supervision, regularly checked and replaced / repaired as

required for the life of the development. Further, in order to protect resident fauna, the hollow-bearing tree must be removed under ecological supervision.

In order to minimise ecological impact in the APZ, it is to be implemented after on-site consultation between the bushfire consultant and project ecologist so that priority trees and native vegetation islands may be retained. Subsequent management of the APZ is to protect these retained areas.

The assessment of likely impact under the New South Wales TSC Act (1995) concluded that a significant impact is not likely to occur upon any state listed threatened species, populations or endangered ecological communities or their habitats due to the small scale changes proposed. Therefore a Species Impact Statement is not recommended to be prepared for the proposal.

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FIGURES

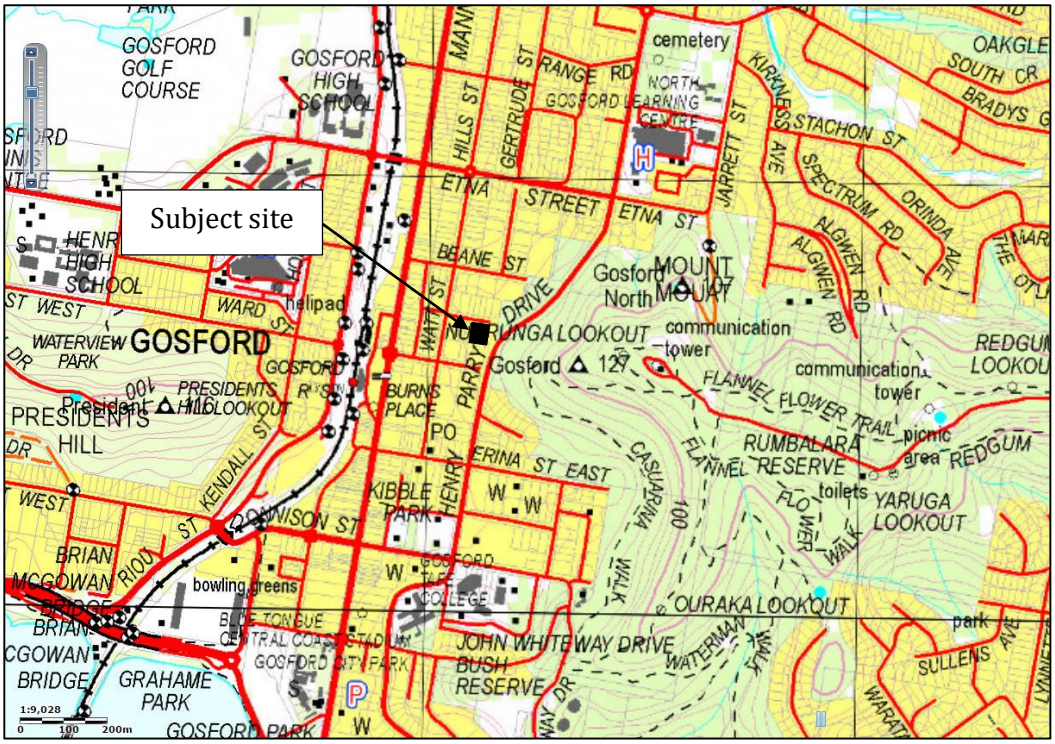


Figure 1: Topographic map showing the subject site (black) occupying low coastal hills. Source map: Department of Lands SIX Viewer.

Figure 2: Locality map showing the subject site (red) in relation to local features. Source map: Department of Lands SIX Viewer.

Figure 3: Close up aerial view of the subject site (red) with the area of vegetation of concern (yellow) being the APZ. Vegetation within the subject site is made up of exotic weeds. Source map: Department of Lands SIX Viewer.

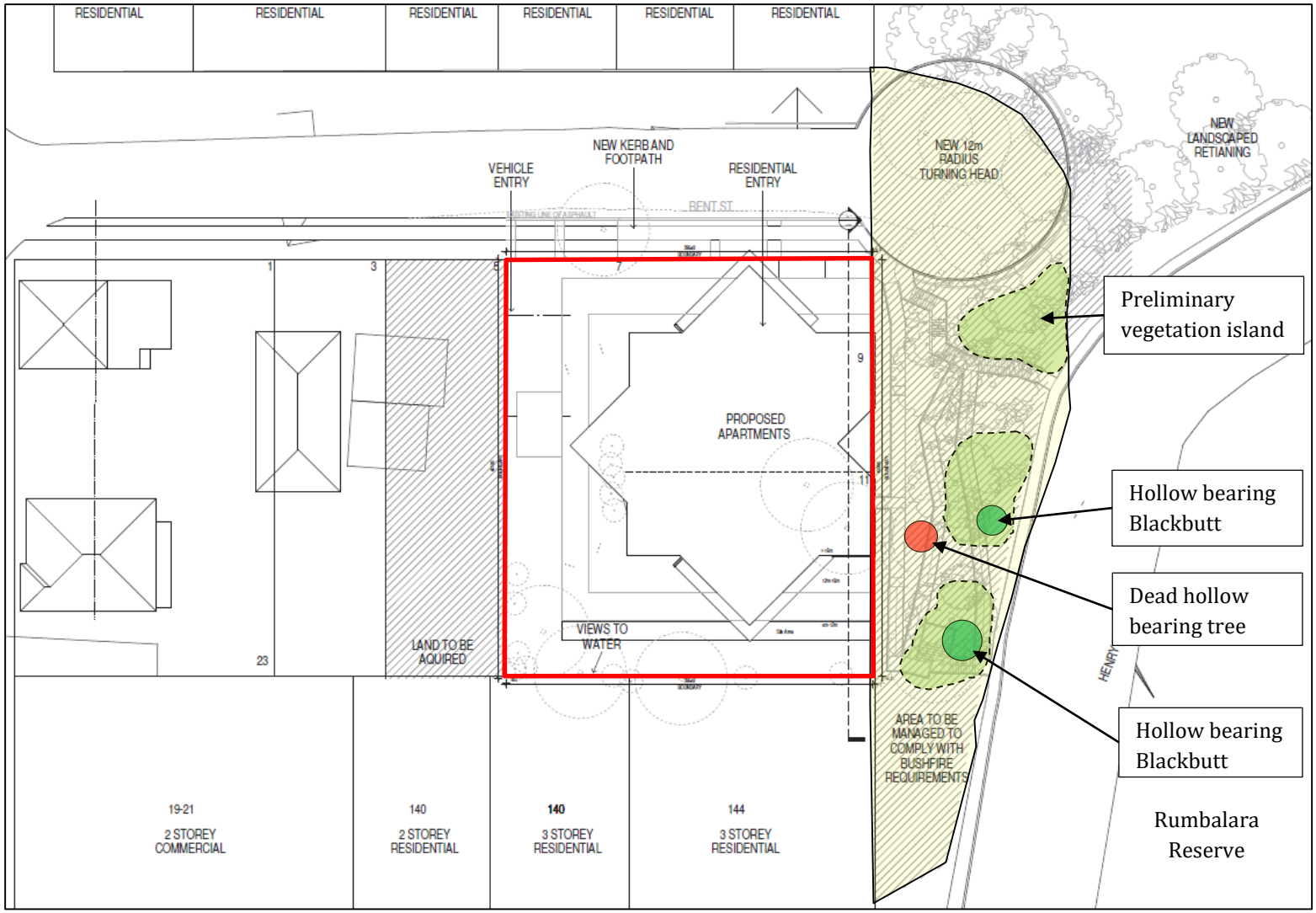


Figure 4: Plan of the proposed layout on the subject site (red outline). The yellow area indicates the area of the APZ; light green marks the preliminary locations of the proposed vegetation islands and the green circles indicate hollow bearing trees to be retained with the red circle indicating the hollow bearing tree to be removed. Source: ADG Architects Project No. 15026, Drawing number DA03 Date printed: 1/10/2015.

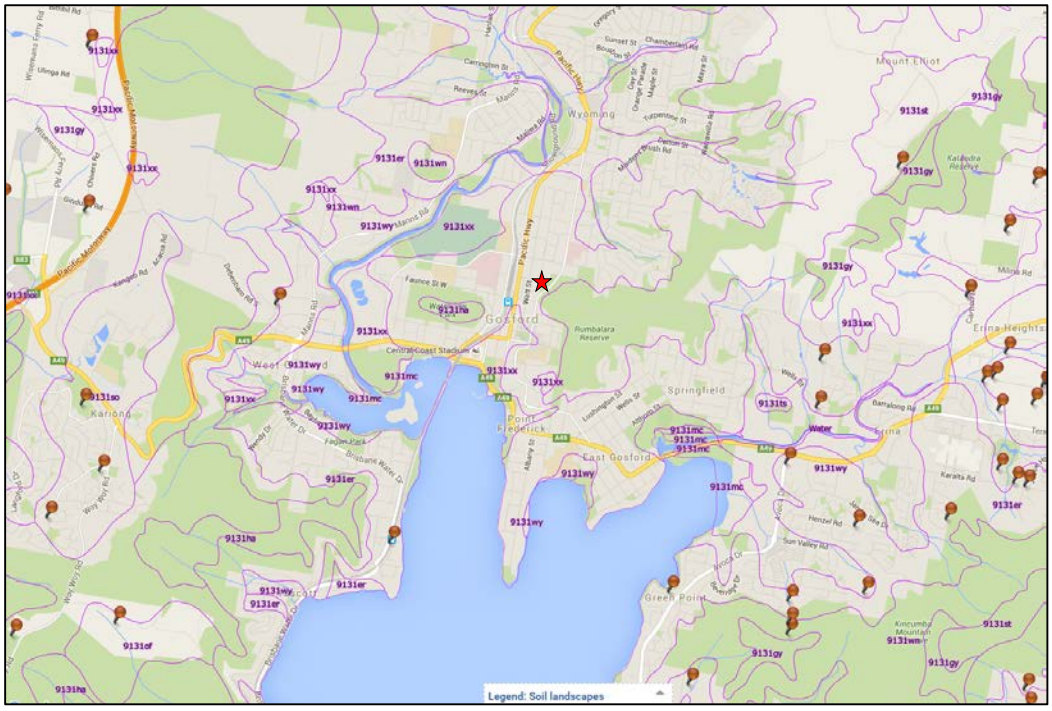


Figure 5: Soil classification for the subject site showing the site wholly within the Erina soil landscape. Source map: NSW Office of Environment and Heritage Soil and land information http://www.environment.nsw.gov.au/eSpadeWebApp/

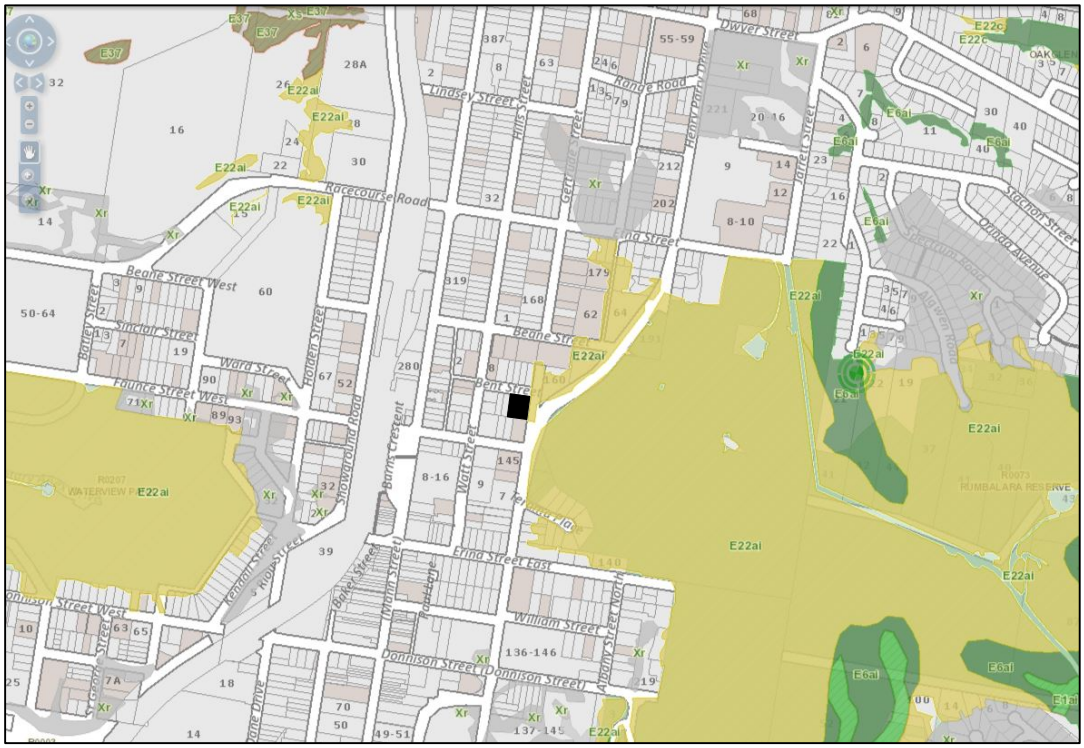
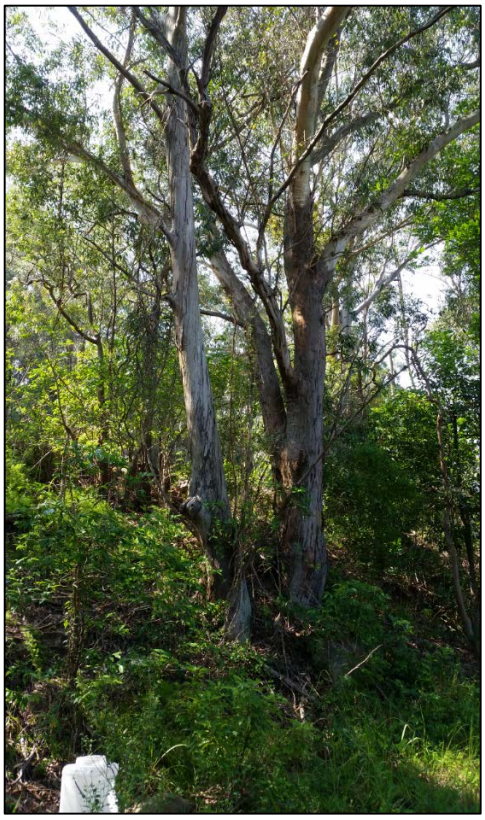


Figure 6: Vegetation mapping of Gosford City Council showing adjacent bushland as E22ai Narrabeen Coastal Blackbutt Forest. Source map: Gosford City Council Electronic mapping system https://maps.gosford.nsw.gov.au/

PHOTOGRAPHS

Photograph 1: View of the eastern boundary of the subject site and the area of APZ. A burnt out car has been dumped within the works area. A wall of *Lantana camara* Lantana edges along the track within the APZ.

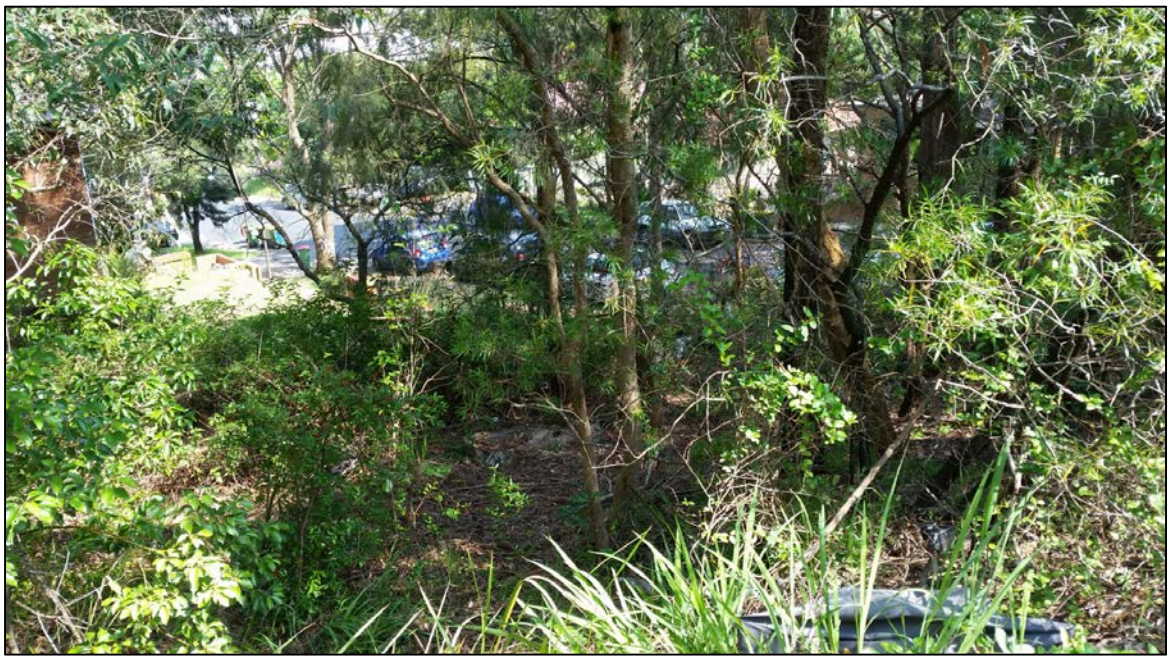
Photograph 2: Vegetation within the proposed turning head area and APZ.



Photograph 3: Dead hollow bearing tree on the slope of the APZ with potential habitat for microbats. A plastic container marked WC was located below with scattered litter.

Photograph 4: looking west over the vacant 11 Bent Street, Gosford. The lot is covered in exotic weeds with a pile of removed fishpole bamboo left on the site and has now become overgrown with weeds. The sewer vent is to be relocated due to proposed works.

Photograph 5: A pile of slashed Bamboo left at the rear of 11 Bent Street has now become overgrown with *Ipomoea cairica* Blue Morning Glory.



Photograph 6: Looking down through the area of APZ from the footpath along Henry Parry Drive.

Photograph 7: View of the top of APZ along Henry Parry Drive. The verge is covered with a mixture of native and exotic grasses.

Photograph 8: A wide gap between Rumbalara Reserve (left) and the area of APZ (right).

Photograph 9: The large Eucalyptus pilularis Blackbutt at the top of the APZ along Henry Parry Drive containing a small hollow suitable for small birds and microbats.

Photograph 10: Man made trail leading from Bent street up to Henry Parry Drive. The track is covered with litter and branches to the left where makeshift shelters were observed.

APPENDIX 1

FLORA AND FAUNA DETAILS

Table 1.1: Flora species observed on the subject site by Keystone Ecological for this study. * = introduced species, N = Noxious Weed, class 2, 4 or 5, WONS = Weed of National Significance. Bold species indicate native vegetation associated with Narrabeen Coastal Blackbutt Forest (Bell 2009b).

Family	Scientific Name	Common Name
Apiaceae	*Cyclospermum leptophyllum*	Slender Celery
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Asparagaceae	*Asparagus aethiopicus* **4, WONS**	Ground Asparagus
Asteraceae	*Ageratina adenophorum* **4**	Crofton Weed
Asteraceae	*Artemisia verlotiorum**	-
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Conyza sp.**	-
Asteraceae	*Coreopsis lanceolata**	-
Asteraceae	*Rudbeckia hirta**	Black-eyed Susan
Asteraceae	*Taraxacum officinale**	Dandelion
Bignoniaceae	*Pandorea pandorana*	Wonga Vine
Caprifoliaceae	*Lonicera japonica**	Japanese Honeysuckle
Casuarinaceae	***Allocasuarina torulosa***	**Forest Oak**
Convolvulaceae	*Ipomoea cairica**	Blue Morning Glory
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Ericaceae	*Leucopogon juniperinus*	Prickly Beard-heath
Euphorbiaceae	***Glochidion ferdinandi var. ferdinandi***	**Cheese Tree**
Fabaceae	*Erythrina X sykesii**	Coral Tree
Fabaceae	*Glycine clandestina*	Twining Glycine
Fabaceae	*Kennedia prostrata*	Running Postman
Fabaceae	*Podolobium ilicifolium*	Prickly Shaggy Pea
Fabaceae	*Senna sp.*	-
Fabaceae	*Trifolium repens**	White Clover
Geraniaceae	*Geranium sp.**	-
Iridaceae	*Freesia sp.**	Freesia
Juncaceae	*Juncus usitatus*	Common Rush
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Liliaceae	*Lilium formosanum**	Formosan Lily
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Lythraceae	*Lagerstroemia indica**	Crepe Myrtle
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Malvaceae	*Pavonia hastate*	-
Mimosaceae	*Acacia longifolia var. longifolia*	Sydney Golden Wattle
Mimosaceae	*Acacia maidenii*	Maiden's Wattle
Moraceae	*Ficus elastica**	Rubber Plant
Myrtaceae	*Angophora floribunda*	Rough-barked Apple

Family	Scientific Name	Common Name
Myrtaceae	***Eucalyptus pilularis***	**Blackbutt**
Myrtaceae	*Eucalyptus punctata*	Grey Gum
Myrtaceae	*Kunzea ambigua*	Tick Bush
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant
Oleaceae	*Ligustrum sinense**	Small-leaved Privet
Oleaceae	*Olea europaea subsp. cuspidata*	African Olive
Phormiaceae	*Dianella caerulea var. cinerascens*	-
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Austrostipa rudis subsp. nervosa*	-
Poaceae	*Avena sativa**	Oats
Poaceae	*Briza maxima**	Quaking Grass
Poaceae	*Briza minor**	Shivery Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Dichelachne crinita*	Long-hair Plume Grass
Poaceae	*Ehrharta calycina**	Perennial Veldtgrass
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Imperata cylindrica var. major*	Blady Grass
Poaceae	*Lolium rigidum**	Stiff Ryegrass
Poaceae	*Microlaena stipoides var. stipoides*	Weeping Rice Grass
Poaceae	*Pennisetum clandestinum**	Kikuyu
Poaceae	*Phyllostachys aurea**	Fishpole Bamboo
Poaceae	*Rytidosperma tenuior*	Wallaby Grass
Poaceae	*Sacciolepis indica*	Indian Cupscale Grass
Poaceae	***Themeda australis***	**Kangaroo Grass**
Proteaceae	*Banksia integrifolia subsp. integrifolia*	Coast Banksia
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung
Ranunculaceae	*Clematis aristata*	Old Man's Beard
Rosaceae	*Rubus fruticosis sp. agg.* [4, WONS]	Blackberry
Rosaceae	*Prunis persica var. nucipersica*	Nectarine
Verbenaceae	*Lantana camara*[WONS]	Lantana
Verbenaceae	*Verbena bonariensis**	Purpletop

Table 1.2: Flora species of conservation significance recorded within 10 km of subject site. E=Endangered, EPop=Endangered Population, Ext=Extinct, V=Vulnerable. Source: OEH Wildlife Atlas database, 2013.

Family	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
Araliaceae	*Astrotricha crassifolia*	V	V	Occurs in dry sclerophyll woodland on sandstone near Patonga, Royal National Park, Woronora Plateau and Glen Davis.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Dilleniaceae	*Hibbertia procumbens*	E	-	Occurs in scrub/heath on skeletal sandy soils and associated with 'hanging swamp' vegetation communities on sandy deposits in the higher western part of Central Coast.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Elaeocarpaceae	*Tetratheca glandulosa*	V		Occurs in shale-sandstone transition habitat on shallow soils associated with Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes. Usually found on ridgetops to mid slopes in heath, scrub, woodland to open forest.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Elaeocarpaceae	*Tetratheca juncea*	V	V	Generally occurs on low nutrient soils associated with the Awaba Soil Landscape from Wyong LGA north to Great Lakes LGA and west to Cessnock LGA. Usually found in low open forest / woodland with a mixed shrub understorey and grassy ground layer.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Ericaceae	*Epacris purpurascens* var. *purpurascens*	V	-	Found in a range of habitat types, most of which have a strong shale soil influence, from Dural to Avon Dam. Found in scrub on periodically poorly-drained clay soil. Associated species include Melaleuca thymifolia, Melaleuca decora. Not CC.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Euphorbiaceae	*Chamaesyce psammogeton*	E	-	Occurs on coastal sand dunes.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Fabaceae	*Senna acclinis* Rainforest Cassia	E	-	Grows in or on the edges of subtropical and dry rainforest. Found in regrowth areas up to 15 years old.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Lamiaceae	*Prostanthera askania*	E	E	Occurs in moist sclerophyll forest and warm temperate rainforest communities on Narrabeen sandstone. Restricted to upper reaches of creeks that flow into Tuggerah Lake or Brisbane Water.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Lamiaceae	*Prostanthera junonis* Somersby Mint Bush	E	E	Probably restricted to the Somersby Plateau. Occurs on both Somersby and Sydney Town soil landscapes on gently undulating land over weathered Hawkesbury sandstone. It occurs in disturbed and undisturbed sites in open scrub, low woodland, or open forest.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Lindsaeaceae	*Lindsaea fraseri* Fraser's Screw Fern	E	-	In NSW known only from the north coast from poorly drained, infertile soils in swamp forest or open eucalypt forest. Record from the Central Coast dates from 1955 and its location is doubtful (Dr E. Brown, National Herbarium of NSW).	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mimosaceae	*Acacia pubescens* Downy Wattle	V	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones on the Cumberland Plain	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Myrtaceae	*Callistemon linearifolius*	V	-	Occurs in dry sclerophyll open forest on sandy to clayey soils on sandstone. Woy Woy population all within 30 m of drainage line. Associated species: Red Bloodwood, Grey Gum, Black She-oak and Smooth-barked Apple. Known from the Illawarra to Grafton area.	Suitable potential habitat on site.	Best detected when in flower from September to March.	3 records from the broader study area occur with the closest and most recent occurring 4km west of the subject site in 2007. Low likelihood to occur.	No further impact assessment required.

Family	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
Myrtaceae	*Darwinia glaucophylla*	V	-	Occurs in sandy heath, scrub and woodlands often associated with sandstone rock platforms or near hanging swamps and friable sandstone shallow soils entirely within the Gosford LGA.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Myrtaceae	*Eucalyptus camfieldii* Camfield's Stringybark	V	V	Occurs in poor coastal country on shallow sandy soils overlying Hawkesbury sandstone; in coastal heath mostly on exposed sandy ridges; and near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Myrtaceae	*Eucalyptus glaucina* Slaty Red Gum	V	V	Occurs only on the north coast of NSW in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils. Record from the Gosford area dates from 1955.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Myrtaceae	*Eucalyptus oblonga* Narrow-leaved Stringybark	Epop	-	The species occurs from Gosford to the Appin and Waterfall districts. The disjunct outlier population at Bateau Bay occurs on coastal sands of the Norah Head Soil Landscape	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Myrtaceae	*Melaleuca biconvexa*	V	V	Occurs in paperbark swamp forest and lowland rainforest.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Myrtaceae	*Melaleuca deanei*	V	V	Grows in heath on sandstone. Occurs in two distinct areas: Ku-ring-gai/Berowra and Holsworthy/Wedderburn.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Myrtaceae	*Syzygium paniculatum* Magenta Lilly Pilly	E	V	Occurs in littoral or riverside gallery rainforests.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Orchidaceae	*Cryptostylis hunteriana* Leafless Tongue Orchid	V	V	Ill-defined habitat preferences but in the Hawkesbury-Nepean CMA is known typically from plateaux woodland dominated by Red Bloodwood, Scribbly Gum, Smooth-barked Apple, Sydney Peppermint with heathy understorey. In Wyong occurs in coastal w'lands MU 31.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Orchidaceae	*Dendrobium melaleucaphilum* Spider Orchid	E	-	Epiphyte in paperbark swamp forest.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Orchidaceae	*Diuris bracteata*	E	Extinct	Small populations are known to occur on roadsides on ridges in the Kulnura area, Pittwater and Brisbane Water National Park. Habitat includes mown grass and the open edges of dry sclerophyll woodland.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Poaceae	*Ancistrachne maidenii*	V	-	Has specific habitat requirements, occurring in dry sclerophyll forest on sandstone derived soils associated with transitional geology between Hawkesbury and Watagan soil landscapes north of Sydney.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Proteaceae	*Grevillea shiressii*	V	V	Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils. Known only from 2 populations near Gosford on the lower tributaries of the Hawkesbury River. Restricted to the Gosford area.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Proteaceae	*Persoonia hirsuta* subsp. *hirsuta*	E	E	Occurs in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Restionaceae	*Baloskion longipes*	V	V	Tablelands species growing in swamps and wet swales in eucalypt forest.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.

Table 1.3: Fauna species of conservation significance recorded within 10 km of subject site. E = Endangered, EPop = Endangered Population, Ext = Extinct, V = Vulnerable, Source: OEH Wildlife Atlas database, 2013

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
Amphibian	*Litoria brevipalmata* Green-thighed Frog	V	-	Occurs in range of forested habitats where surface water gathers after rain.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Amphibian	*Litoria aurea* Green and Golden Bell Frog	E	V	Inhabits marshes, dams and stream-sides.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Amphibian	*Heleioporus australiacus* Giant Burrowing Frog	V	V	Found in heath, w'land and OF w sandy soils. Critical hab: fish-free pools, sandy soils nearby. Emerges to feed/breed after rain; travels 100s m to cks to breed. Surveys to be u'taken after 5mm r'fall with temp above 8 deg.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Amphibian	*Mixophyes balbus* Stuttering Frog	E	V	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Amphibian	*Mixophyes iterates* Giant Barred Frog	E	E	Forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m; breed around shallow, flowing rocky streams from late spring to summer.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Amphibian	*Pseudophryne australis* Red-crowned Toadlet	V		Restricted to heads of periodically wet drainage lines below sandstone ridges that often have shale caps. Needs rocks and dense vegetation or litter for shelter.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Amphibian	*Crinia tinnula* Wallum Froglet	V	-	Found only in acid paperbark swamps and sedge swamps.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Reptile	*Chelonia mydas* Green Turtle	V		Terrestrial habitat restricted to marine beaches.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Reptile	*Varanus rosenbergi* Rosenberg's Goanna	V	-	Found in heath, open forest and woodland; termite mounds are a critical habitat component for nesting. Shelters in hollow logs, rock crevices and in burrows.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Reptile	*Hoplocephalus bitorquatus* Pale-headed Snake	V	-	Found in eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. Favours streamside areas, and shelters under loose bark or in tree hollows.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Reptile	*Hoplocephalus bungaroides* Broad-headed Snake	E	V	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves to shelters in hollows in large trees within 200 m of escarpments in summer. Feeds on geckos, small skinks; also frogs, small mammals.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Reptile	*Hoplocephalus stephensii* Stephens' Banded Snake	V	-	Found in large areas of rainforest and eucalypt forest with abundant hollows.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Diomedea exulans* Wandering Albatross	E	V	Terrestrial habitat confined to offshore islands just north of the Antarctic circle.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Thallasarche melanophris* Black-browed Albatross	V	V	Terrestrial habitat confined to offshore islands.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Pterodroma nigripennis* Black-winged Petrel	V	-	Terrestrial habitat confined to offshore islands, including Lord Howe Island.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Ardenna tenuirostris* Short-tailed Shearwater	-	M	Breeds on offshore islands from SA to Broughton Island, north of Newcastle. After breeding, wholly absent from Australia from May to September.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Ardenna pacificus* Wedge-tailed Shearwater	-	M	Breeds on offshore islands along NSW coast. Absent from NSW from May to August.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Ardenna carneipes* Flesh-footed Shearwater	V	-	Terrestrial habitat confined to Lord Howe Island.	No suitable habitat on site.		No likelihood to occur.	No further impact

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
								assessment required.
Bird	*Ardea ibis* Cattle Egret	-	M	Widespread, common and expanding. Occurs in grasslands, wooded lands and wetlands. Most commonly found foraging with livestock. Roosts in trees in or near lakes and swamps. Breeds in colonies in wooded swamps.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Ixobrychus flavicollis* Black Bittern	V	-	Occurs in freshwater and estuarine wetlands.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Egretta sacra* Eastern Reef Egret	-	M	Lives on exposed reefs, rocky shores, beaches, mudflats, islands. Roosts and nests in woodland, scrub adjacent to beaches.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Ephippiorhynchus asiaticus* Black-necked Stork	E	-	Inhabits permanent freshwater wetlands	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Pandion cristatus* Eastern Osprey	V	-	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Lophoictinia isura* Square-tailed Kite	V	-	Found in timbered habitats with a particular preference for timbered watercourses	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Hamirostra melanosternon* Black-breasted Buzzard	V	-	Lives in a range of inland habitats, especially along timbered watercourses Central Coast record is probably a misidentification or vagrant.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Hieraaetus morphnoides* Little Eagle	V	-	Seen over woodland and forested lands and open country, extending into the arid zone; tends to avoid rainforest and heavy forest. Nest in mature living trees in open woodland or tree-lined watercourses; rarely in isolated trees.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Haliaeetus leucogaster* White-bellied Sea-eagle	-	M	Most commonly seen foraging over water bodies or near coastal waters; will occasionally forage over open country for carrion. Highly mobile and travels long distances. Nests and roosts high in trees in well timbered country.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Falco subniger* Black Falcon	V	-	Found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. Roosts in trees at night and often on power poles by day. Prey includes birds, small mammals, insects, reptiles and sometimes carrion.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Burhinus grallarius* Bush Stone-curlew	E	-	Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber	Suitable potential habitat on site.	Detectable all year but particularly in breeding season in late winter - early spring.	484 records from the broader study area occur with the most recent being 5km south east of the subject site in 2015 and the closest being 1km north of the subject site in 1993. All records are located along the edge of Brisbane water near permanent waterways. Low likelihood to occur.	No further impact assessment required.
Bird	*Haemotopus fuliginosus* Sooty Oystercatcher	V	-	Occurs on rocky headlands and exposed reefs, beaches and muddy estuaries	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Haemotopus longirostris* Australian Pied Oystercatcher	E	-	Favours intertidal flats of inlets and bays, open beaches and sandbanks	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Charadrius mongolus*	V	-	Occurs on beaches, harbours and estuaries with large	No suitable habitat on		No likelihood to	No further impact

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
	Lesser Sand-plover			intertidal sand flats or mudflats	site.		occur.	assessment required.
Bird	*Calidris ruficollis* Red-necked Stint	-	M	Tidal mudflats, saltmarsh, sandspits, sandy or shell-grit beaches, shallow margins of salt or freshwater lakes often far inland, sewage farms. Winters in southern hemisphere.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Tringa brevipes* Grey-tailed Tattler	-	M	Estuaries, wave-washed rocks and reefs, waterways in mangroves, tidal mudflats, beaches. Overwinters in southern hemisphere.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Numenius phaeopus* Whimbrel	-	M	Estuaries, channels among mangroves, tidal flats, coral cays, flat exposed reefs, flooded paddocks, occasionally sewage farms, bare grasslands, sportsgrounds, lawns. Winters in southern hemisphere.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Numenius madagascariensis* Eastern Curlew	-	M	Mainly coastal: sandspits, mudflats, waterways in saltmarsh, mangroves; occasionally fresh or brackish lakes, bare grassland near water.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Gallinago hardwickii* Latham's Snipe	-	M	Non-breeding migrant to Australia in the warmer months. Found in dense cover in any vegetation around wetlands, also saltmarsh and creek edges when migrating.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Numenius minutus* Little Curlew	-	M	Breeds in Siberia, non-breeding migrant to Australia. Widespread in northern part Australia and disperses to inland and coastal wetlands in response to the wet season.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Xenus cinereus* Terek Sandpiper	V	M	Occurs on coastal mudflats, lagoons, creeks and estuaries	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Calidris ferruginea* Curlew Sandpiper	E	M	Breeds in Siberia and migrates to Australia in warmer months. Forages in shallow water of intertidal mudflats of sheltered coasts. Roosts on beaches, spits/islets, saltmarsh or on rocky shore.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Tringa nebularia* Common Greenshank	-	M	Breeds in the Palaearctic. In Australia over summer, on coast and inland, in estuaries, mudflats, mangrove swamps and lagoons.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Limosa lapponica* Bar-tailed Godwit	-	M	Tidal mudflats, estuaries, sewage farms; occasionally on shallow river-margins, brackish or salty inland lakes, flooded pastures, airfields. Needs soft sand / mud. Winters in southern hemisphere.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Calidris canutus* Red Knot	-	M	Breeds in the Arctic and flies non-stop to Australia. Feed in large flocks on the coast in sandy estuaries with tidal mudflats.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Calidris acuminate* Sharp-tailed Sandpiper	-	M	Summer migrant to Australia from the Arctic. Prefers grassy edges of shallow inland freshwater wetlands. Found also on sewage farms, flooded fields, mudflats, mangroves, beaches and rocky shores.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Stercorarius parasiticus* Arctic Jaeger	-	M	Coastal offshore waters, larger bays, occasionally coastal inlets, lakes, usually in storms. Overwinters in southern hemisphere.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Hydroprogne caspia* Caspian Tern	-	M	Large waters generally, fresh or salt lakes, larger rivers, reservoirs, estuaries, tidal mudflats, beaches, shallow coastal waters.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Sternula albifrons* Little Tern	E	-	Prefers sheltered coastal environments; may occur several kms from the sea in harbours, inlets and rivers. Nests in small colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Gygis alba* White Tern	V	-	Terrestrial habitat confined to Lord Howe Island	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Sterna Hirundo*	-	M	Offshore waters, beaches, reefs, bays, tidal mudflats, lower	No suitable habitat on		No likelihood to	No further impact

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
	Common Tern			reaches of larger rivers with sandbars, sewage farms, occasionally swamps near coast. Overwinters in southern hemisphere.	site.		occur.	assessment required.
Bird	*Ptilinopus superbus* Superb Fruit-dove	V	-	Occurs in rainforest.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Ptilinopus magnificus* Wompoo Fruit-dove	V	-	Occurs in rainforest.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Calyptorhynchus lathami* Glossy Black-Cockatoo	V	-	Breeds in large hollow-bearing trees in forest and forages on *Allocasuarina* species.	Suitable potential foraging habitat on site.	Detectable all year.	125 records from the broader study area occur with the closest and most recent being 5km north west of the subject site in 2014. Moderate to high likelihood to occur.	Further impact assessment required.
Bird	*Callocephalon fimbriatum* Gang-gang Cockatoo	V,EPop	-	In summer, generally found in montane forests and woodlands; in winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Breeds in large and old hollow-bearing trees in forest.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Glossopsitta pusilla* Little Lorikeet	V	-	Mostly in dry open eucalypt forests and woodlands. Feeds on tree nectar and pollen, particularly profusely-flowering eucalypts, but also melaleucas and mistletoes and mistletoe fruit. Nomadic, movements probably related to food availability.	Suitable potential marginal habitat on site.	Detectable all year.	21 records from the broader study area occur with the most recent being 6km north west of the subject site in 2008 and the closest being 3km north west of the subject site in 2007. High likelihood to occur.	Further impact assessment required.
Bird	*Neophema pulchella* Turquoise Parrot	V	E	Inhabits woodlands adjoining clearings, timbered ridges and creeks in farmland. Forages on ground feeding on grass seed or low vegetation.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Lathamus discolor* Swift Parrot	E	E	Occurs on mainland between March and October where eucalypts are flowering profusely or where there are abundant lerp infestations.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Tyto novaehollandiae* Masked Owl	V	-	Occurs in forests, but often hunts along forest edges such as roadsides.	Suitable potential habitat on site.	Detectable all year.	25 records from the broader study area occur with the most recent being 8km west of the subject site in 20009 and the closest being 2km south of the subject site in 1992. Low likelihood to occur.	No further impact assessment required.
Bird	*Ninox strenua* Powerful Owl	V	-	Usually roosts in dense vegetation and hunts for arboreal mammals across large home range	Suitable potential habitat on site.	Detectable all year.	149 records from the broader study area occur with the most recent being 4km	Further impact assessment required.

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
							north east of the subject site in 2015 and the closest being 1km south of the subject sitein 2013. High likelihood to occur.	
Bird	*Tyto tenebricosa* Sooty Owl	V	-	Occurs in rainforest and moist eucalypt forests. Forages on arboreal mammals.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Ninox connivens* Barking Owl	V	-	Occurs in eucalypt woodland, open forest, swamp woodlands and timbered watercourses. Occasionally uses dense vegetation for roosting. Breeds in hollows in large old trees.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Hirundapus caudacutus* White-throated Needletail	-	M	Non-breeding popn migrates from Asia in spring and departs autumn along either side of Gt Div Rge. Most of its time spent feeding on the wing, high along storm fronts. Roosts infrequently in terrestrial habitats and terrestrial habitat largely irrelevant.	No suitable habitat on site.		No likelihood to occur.	No further impact assessment required.
Bird	*Apus pacificus* Fork-tailed Swift	-	M	Almost exclusively aerial, flying over most habitat types. Arrive from Siberia in spring and depart in autumn. Feed on edge of low pressure systems. Threats to this species in Australia are negligible.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Petroica boodang* Scarlet Robin	V	-	Occurs in open forests and woodlands. During winter, will visit more open habitats such as grasslands, farmland and urban parks and gardens but abundant logs and coarse woody debris are important structural components of its habitat.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Pomatostomus temporalis* Grey-crowned Babbler	V	-	In NSW, occurs from upper Hunter Valley to the western slopes in Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Central Coast record is probably a misidentification or vagrant.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Cthonicola sagittata* Speckled Warbler	V	-	Occurs on tablelands and rarely on the coast in large tracts (>100 hectares) of grassy eucalypt woodlands.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Daphoenositta chrysoptera* Varied Sittella	V	-	Found in eucalypt woodlands and forests, preferring rough-barked trees or mature trees with hollows or dead branches.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Grantiella picta* Painted Honeyeater	V	-	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Anthochaera phrygia* Regent Honeyeater	CritE	E	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Occasionally non-breeding flocks forage in Swamp Mahogany and Spotted Gum forests on central and north coast and rarely on the south coast	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Epthianura albifrons* White-fronted Chat	V,EPop	-	On coast, found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Bird	*Stagonopleura guttata* Diamond Firetail	V	-	Widely distributed in tablelands and western slopes with few coastal records from near Sydney, Hunter Valley and the Bega Valley. Usually found in grassy eucalypt woodlands, feeding on seeds and insects in grassy	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
				understorey.				
Mammal	*Dasyurus maculatus* Spotted-tailed Quoll	V	E	Occurs in a number of forest habitats but requires large areas of relatively intact forest	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Dasyurus viverrinus* Eastern Quoll	E	-	No recent sightings of this species in NSW – may be extinct.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Isoodon obesulus obesulus* Southern Brown Bandicoot	E	E	Generally found in heath or open forest. Record north of Hawkesbury River is road kill at Woy Woy.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Phascolarctos cinereus* Koala	V	V	Occurs where suitable food trees present, generally on rich open valleys.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Petaurus australis* Yellow-bellied Glider	V	-	Favours tall mature eucalypt forest in areas with high rainfall and nutrient rich soils.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Petaurus norfolcensis* Squirrel Glider	V	-	Found in forest and woodland with diverse understorey that provides forage throughout the year.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Cercartetus nanus* Eastern Pygmy-possum	V	-	Mostly found in woodland and heath with dense cover of flowering plants such as Banksia, Eucalyptus and Callistemon.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Potorous tridactylus* Long-nosed Potoroo	V	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is essential and sandy loam soil is common habitat feature.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Macropus parma* Parma Wallaby	V	-	Preferred habitat is moist eucalypt forest with dense shrubby understorey with grassy open areas nearby.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Pteropus poliocephalus* Grey-Headed Flying-fox	V	V	Foraging habitat in flowering eucalypts, particularly winter-flowering species; camps in dense wet forest or rainforest gullies.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat	V	-	Roosts in tree hollows, buildings or terrestrial burrows in treeless areas. Forages high over forest canopy for insects.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Mormopterus norfolkensis* Eastern Freetail-bat	V	-	Occur in dry sclerophyll forest and woodland, roost in hollows and man-made structures.	Suitable potential habitat on site.	Detectable all year.	33 records from the broader study area occur with the most recent being 7km east of the subject site in 2015 and the closest being 2km north of the subject site in 2008. High likelihood to occur.	Further impact assessment required.
Mammal	*Miniopterus schreibersii oceanensis* Eastern Bent-wing Bat	V	-	Roosts in caves and forages above tree canopies	Suitable potential habitat on site.	Most detectable mid spring to mid autumn. Thought to hibernate from June to August.	97 records from the broader study area occur with the most recent being 6km west of the subject site in 2015 and the closest being less than 1km south of the subject site in 1994. High likelihood to occur.	Further impact assessment required.
Mammal	*Miniopterus australis*	V	-	Roosts in caves and forages beneath tree canopies.	Suitable potential	Most detectable mid	93 records from the	Further impact

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
	Little Bentwing-bat				habitat on site.	spring to mid autumn. Thought to hibernate from June to August.	broader study area occur with the most recent being 6km west of the subject site in 2015 and the closest being 1km west of the subject site in 2013. High likelihood to occur.	assessment required.
Mammal	*Chalinolobus dwyeri* Large-eared Pied Bat	V	V	Roosts in caves and found mainly in areas with extensive cliffs and caves. Generally rare with a very patchy distribution in NSW. Found in well-timbered areas containing gullies.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Myotis Macropus* Large-footed Myotis	V	-	Forages over large bodies of water and roosts in hollows or under old wooden bridges up to 10 km from foraging habitat.	Suitable potential habitat on site.	Detectable all year.	20 recrods from the broader study area occur with the most recent being 6km west of the subject site in 2015 and the closest being 2km south of the subject site in 2001. High likelihood to occur.	Further impact assessment required.
Mammal	*Scoteanax rueppellii* Greater Broad-nosed Bat	V	-	Found in a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though most commonly found in tall wet forest. Roosts in tree hollows and forages over creeks and other corridors in forest.	Suitable potential habitat on site.	Most detectable mid spring to mid autumn.	43 records from the broader study area occur with the most recent being 9km north east of the subject site in 2012 and the closest being 3km west of the subject site in 2003. Moderate likelihood to occur.	No further impact assessment required.
Mammal	*Phoniscus papuensis* Golden-tipped Bat	V	-	Found in rainforest and adjacent sclerophyll forest. Roosts in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests located in rainforest gullies on small first- and second-order streams.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Falsistrellus tasmaniensis* Eastern False Pipistrelle	V	-	Absent from small remnant patches. Prefers continuous tall wet forests (trees >20m tall, dense u/storey) where they forage along tracks, creeks, rivers. Roosts in colonies (3-80 individuals) usually in hollows and changes roosts daily. Home range >100ha.	Suitable potential habitat on site.	Most detectable mid spring to mid autumn.	28 records from the broader study area occur with the most recent being 7km east of the subject site in 2010 and the closest being 3km north east of the subject site in 2000.	Further impact assessment required.

Fauna Group	Scientific Name	Status TSC Act (1995)	Status EPBC Act (1999)	Habitat Requirements	Suitability of Site	Survey considerations	Likelihood to occur	Impact assessment
							Moderate to high likelihood to occur.	
Mammal	*Vespadelus troughtoni* Eastern Cave Bat	V	-	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.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Pseudomys gracilicaudatus* Eastern Chestnut Mouse	V	-	Occurs in heathland most common in dense, wet heath and swamps	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.
Mammal	*Pseudomys novaehollandiae* New Holland Mouse	-	V	Known to inhabit open heathlands, woodlands, forests with a heathy understorey and vegetated sand dunes. It is patchy in time and space, with peaks in abundance in early to mid stages of regrowth, typically after fire.	No suitable habitat on site.		Low likelihood to occur.	No further impact assessment required.

APPENDIX 2
SECTION 5A ASSESSMENTS

***Calyptorhynchus lathami* Glossy Black-Cockatoo**

The Glossy Black-Cockatoo is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999). A population of this species in the Riverina has been listed as an Endangered Population (NSW Scientific Committee 1999) under the TSC Act (1995) due to considerable pressure form a number of identified threats.

The Glossy Black-Cockatoo is the smallest of the black cockatoo species in Australia. This species is usually seen in pairs or sometimes with a single young. It breeds in autumn and winter and requires large hollows for nesting.

It is reported to prefer dry forest types in intact, less rugged landscapes (NSW NPWS 1999) and is distributed mainly along the eastern half of NSW and the south eastern corner of Queensland (Slater et al. 1995). In NSW, this species is recorded in highest densities to the east of the Great Dividing range, however scattered records exist as far west as the Riverina and Pilliga Scrub (Garnett and Crowley 2000).

The southern Yengo and Parr reserves provide an extensive area of high quality habitat for this species and appears to support greater numbers than in the northern part of Yengo National Park (DECC 2008, DEC 2005).

It is a highly specialised feeder, requiring cones from specific Allocasuarina, including *Allocasuarina littoralis* Black Sheoak and *Allocasuarina torulosa* Forest Sheoak (OEH 2015a) and *Casuarina* species (Garnett and Crowley 2000) and so impacts on these food resources (such as from inappropriate fire regimes) may threaten this species. However this species is well protected across the sandstone environments of the Sydney Basin and no management actions are recommended within the Yengo and Parr areas (DECC 2008). The Glossy Black Cockatoo is dependent on large hollow bearing eucalypts for nesting and lay a single egg between March and May (OEH 2015a).

This species was not recorded on the subject site. Potential foraging habitat for this species occurs in the plentiful female Allocasuarina trees.

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

Response:

Critical habitat features for this species include foraging resources and breeding hollows. A relatively small area of foraging habitat will be disrupted and no suitable hollow-bearing trees occur on site. Therefore it is judged that the proposal is unlikely to significantly disrupt the life cycle of this species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

An Endangered population of this species has been listed for the Riverina Local Government Area. This does not coincide with Gosford Local Government Area.

(c) 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 it's local occurrence is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(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,

Response:

This question is not relevant to a threatened species.

(d) 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

Response:

Approximately 1,985 square metres of vegetation will be removed within the total development envelope. 968 square metres of this is within the APZ and will have understorey modified.

(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,

Response:

The connectivity of the vegetation and habitats on site with off-site habitats will only be

minimally diminished. The development envelope is situated downslope of Henry Parry Drive. The major connection to other habitats to the east and north will remain intact with vegetation islands to maintain connectivity.

The development configuration will not further fragment or isolate potential habitat for such a highly mobile species.

(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

Response:

Foraging resources such as provided in the APZ are common across the APZ and in local bushland. The small area to be disturbed by the proposal does not constitute important habitat.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

No critical habitat has been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

This species has been assigned to the "Landscape species" management stream under the NSW Office of Environment and Heritage. A number of recovery strategies have been identified (OEH 2015b).

1. Identify and map key breeding and foraging habitat, similar to the mapping done at St Georges Basin.
2. Provide incentives for landholders to fence and manage key sites.
3. Assist landholders who wish to enter into voluntary conservation agreements at key sites.
4. Prepare and distribute EIA guidelines to decision makers.
5. Periodically review IFOA prescriptions to ensure adequate protection of nesting and foraging habitat.
6. Develop/encourage strategic planning approach for Glossy Black Cockatoo at the local and regional level.
7. Encourage the restoration of foraging habitat that has been cleared or degraded by previous impacts.
8. Increase landholder and public awareness and interest in Glossy Black Cockatoo conservation and habitat management.

9. Utilise the Glossy Black Cockatoo as a flagship threatened species for woodland and forest conservation education and awareness programs.
10. Continue existing monitoring programs (e.g. Goonoo population) and encourage other community groups to develop a monitoring program of local populations.

The following recovery activities have also been identified for this species (OEH 2015a):

1. Reduce the impact of burning to retain diverse understorey species and in particular to permit the regeneration of she-oaks.
2. Protect existing and future hollow-bearing trees for nest sites.
3. Retain and protect areas of native forest and woodland containing she-oaks.
4. Establish forested corridors linking remnant areas of habitat; include local she-oak species in bush revegetation works.
5. Report suspected illegal bird trapping and egg-collecting to the OEH.

The proposal will not interfere with these strategies.

A number of recovery strategies have been identified specifically for the Riverina population (OEH 2015c):

- Map distribution and condition of foraging habitat.
- Monitor population size and recruitment annually.
- Identify nest sites and map distribution of nesting habitat.
- Provide input to local fire management plans to ensure appropriate management of habitat.
- Develop and implement management plans for important areas of habitat.
- Provide incentives for landholders to fence and manage important areas of habitat.
- Undertake co-ordinated control of feral herbivores.
- Increase the extent of foraging and nesting habitat.
- Negotiate management agreements and covenants over important areas of habitat.
- Prepare and distribute information to decision makers.
- Increase landholder and public awareness of status, threats and priority actions.
- Investigate breeding biology and foraging ecology.

Of Relevance to this proposal in the Riverina area are the following (OEH 2015a):

- Implement appropriate fire regimes within she-oak stands so as to avoid the widespread burning of food resources at one time, to promote regeneration of stands, and to maximise the food value of stands.
- Retain hollows (including protection of existing mature trees); plant native hollow producing species; ensure that some trees are always left to grow to maturity; as a last resort place artificial hollows (e.g. nest boxes) around area.
- Avoid disturbing the species; deny access to people who may be involved in illegal collection.
- Prevent clearing of she-oak stands.

- Prevent clearing of potential nesting habitat, including paddock trees and standing dead trees.
- Protect known nest sites from clearing or disturbance.
- Increase the extent of she-oak stands by restoring degraded habitat areas, implementing appropriate fire regimes, and planting where necessary.
- Undertake annual population monitoring in the post-breeding season.
- Determine size and structure of population; investigate breeding biology.
- Clarify population genetics.

The majority of the vegetation will be allowed to regenerate naturally and *Eucalyptus pilularis* Blackbutt was a common element of the canopy. The wildlife corridor function will not be compromised for this highly mobile species by the development of the proposed dwelling.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Response:

Recognised threats to this species include (OEH 2015a):

- Reduction of suitable habitat through clearing for development.
- Decline of hollow bearing trees over time due to land management activities.
- Excessively frequent fire which eliminates sheoaks from areas, prevents the development of mature sheoak stands, and destroys nest trees.
- Firewood collection resulting in loss of hollow bearing trees, reduced recruitment of hollow bearing trees, and disturbance of breeding attempts.
- Decline in extent and productivity of sheoak foraging habitat due to feral herbivores.
- Limited information on the location of nesting aggregations and the distribution of high quality breeding habitat.
- Disturbance from coal seam gas and open cut coal mining causing loss of foraging and breeding habitat as well as disturbing reproductive attempts.
- Forestry activity resulting in loss of hollow bearing trees, reduced recruitment of hollow bearing trees, degradation of foraging habitat, and disturbance of breeding attempts.
- Decline in extent and productivity of sheoak foraging habitat caused by moisture stress due to climate change.
- Degradation of foraging habitat and reduced regeneration of sheoak stands due to grazing by domestic stock.
- Loss of foraging habitat due to slashing/underscrubbing.
- Change in the spatial and temporal distribution of foraging resources due to global warming.
- Illegal bird smuggling and egg-collecting.

The proposal contributes to the Key Threatening Process "Clearing of Native Vegetation" and "loss of hollow bearing trees".

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Glossopsitta pusilla Little Lorikeet

The Little Lorikeet is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Little Lorikeet is the smallest of the Lorikeets, with a black bill, bright green body and red forehead and throat (Pizzey and Knight 1997). It may be confused with other small lorikeets such as the Purple-crowned Lorikeet, but makes a distinctively lower-pitched and buzzing call in flight (Higgins 1999).

It is known from coast and south eastern Australia from near Cairns in far north Queensland to Adelaide (Pizzey and Knight 1997). In New South Wales it occurs in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (Barrett *et al.* 2003). They occur mostly in dry open eucalypt forests and woodlands in old growth and logged forest as well as in remnant patches and roadside vegetation (NSW Scientific Committee 2009).

This species is generally considered to be nomadic, moving in response to flowering eucalypts (NSW Scientific Committee 2009). A long term study of a population on the north western slopes revealed that they are resident from April to December and may return to the nest area if some trees are flowering in the vicinity (Courtney and Debus 2006).

They usually forage in the tree canopies in small flocks and sometimes in the company of other lorikeet species (Readers Digest 2002). Profusely-flowering eucalypts are favoured, such as box species on the slopes and tablelands (Courtney and Debus 2006) and in *Eucalyptus robusta* Swamp Mahogany and *Eucalyptus pilularis* Blackbutt on the Central Coast (pers obs). Blossom of other trees are also used (e.g. *Melaleuca* species) and the fruits of mistletoes are also sometimes eaten (NSW Scientific Committee 2009).

This species is an obligate hollow nester (Gibbons and Lindenmayer 2002) that are usually located high in the trees (Pizzey 1980) but sometimes as low as 2 metres (Courtney and Debus 2006) in living smooth-barked eucalypts. The entrances to these nests are small (approximately 3 centimetres in diameter) and are kept open by the lorikeets chewing at the growing bark (NSW Scientific Committee 2009). Hollows are known to be used continuously, with one used for at least 29 years (Courtney and Debus 2006). The breeding season extends from May to September (Higgins 1999) or July to January with a peak in October (Barrett et al. 2003).

Population trends are uncertain with evidence of decline in part of its range (e.g. in South Australia, south west slopes and south coast of NSW) (NSW Scientific Committee 2009) but there appeared to be a small increase across NSW according to latest Bird Atlas (Barrett et al. 2003). The NSW Scientific Committee (2009) considers that the data indicate a moderate state-wide reduction in population size over the past 15 years or three generation lengths, a time frame equivalent to the life cycle of the species. Also, there are many examples of bird species that are threatened nationally whose initial decline was first apparent in South

Australia (Horton and Black 2006).

Threats to this species include loss of breeding sites and foraging resources due to land clearing which is particularly relevant in the western districts where road-widening has removed important patches of remnant woodland (NSW Scientific Committee 2009). Observations of 50 nest hollows over 43 years noted a 40% loss (the majority caused by humans) without a commensurate rate of hollow replacement (Courtney and Debus 2006).

This species was not recorded in the study area. Potential foraging habitat for this species occurs with *Eucalyptus pilularis* Blackbutt being prominent in the VMP area.

(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,

Response:

The area of potential foraging habitat for this species occurs within the area of APZ. This habitat will have some impact due to loss of understorey due to fire controls however; the main food source within the APZ *Eucalyptus pilularis* Blackbutt will have minimal removal. The site may also be enhanced as part of the rehabilitation and weed management of the remnant and regrowth vegetation.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species

(c) 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

Response:

This question is not relevant to a threatened species

(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,

Response:

This question is not relevant to a threatened species.

(d) 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

Response:

Approximately 968 square metres of potential habitat for this species will be impacted by the proposal and bushfire controls.

(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

Response:

The connectivity of the vegetation and habitats on site with off-site habitats will only be minimally diminished. The development envelope is situated downslope of Henry Parry Drive. The major connection to other habitats to the east and north will remain intact with vegetation islands to maintain connectivity.

The development configuration will not further fragment or isolate potential habitat for such a highly mobile species.

(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,

Response:

The site provides blossom in the spring and summer when such foraging resources are commonly available across the local area. 2 small tree hollows were identified within he APZ that are suitable for this species however they are to be retained and managed.

The subject site therefore does not provide important habitat for the survival of a local population of this species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

No critical habitat has been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery

plan or threat abatement plan,

Response:

This species has been assigned to the "landscape species" management stream by the NSW Office of Environment and Heritage. The interim management actions identified for this species include:

1. Encourage retention of old-growth and hollow-bearing trees through community engagement and other mechanisms including PVPs, BioBanking and EIA; and
2. Avoid burning woodland with old-growth and hollow-bearing trees.

A number of recovery strategies have been identified (OEH 2015b):

3. Retain large old trees, especially those that are hollow-bearing;
4. Ensure recruitment of trees into the mature age class so that there is not a lag period of decades between the death of old trees and hollow formation in younger trees;
5. Protect large flowering Eucalyptus trees throughout the habitats frequented by this species. Manage remnant woodlands and forest for recovery of old-growth characteristics;
6. Where natural tree recruitment is inadequate, replant local species to maintain foraging habitat and breeding sites;
7. Reduce the abundance of feral Honeybees and limit the exploitation of nectar by domestic bees where resources are spatially or temporally sparse (e.g. in years of drought); and
8. Document nest sites and ensure their protection.

The proposal is consistent with these recovery strategies.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Response:

The proposed works will contribute in a minor way to the Relevant Key Threatening Process "Clearing of Native Vegetation" and "Loss of Hollow-bearing Trees".

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***Ninox strenua* Powerful Owl**

The Powerful Owl is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Powerful Owl is the largest of the Australia Owls, with bold chevrons across the chest.

This species is recorded from most types of sclerophyll forest along the south east coast of Australia (Slater et al. 1995), generally on the eastern slopes of the Great Dividing Range. Habitat ranges from tall open forests to woodland, however it is often found roosting or nesting in large trees along gullies (Simpson and Day 1999).

The Powerful Owl requires large hollows (generally with a diameter greater than 30 centimetres) for breeding. Home ranges for territorial pairs appear to range from 800 to 1,000 hectares (although much larger territories have been recorded) (Kavanagh 2002).

This species can be observed roosting in dense vegetation during the day, often clutching the remains of prey species in its talons. The Powerful Owl is a specialist predator of arboreal marsupials, particularly the Common Ringtail Possum in coastal lowland areas and the Greater Glider in the tablelands, but the Sugar Glider, Common Brushtail Possum and Grey-headed Flying-fox are also common prey species (DECCW 2010). Its diet is also supplemented by diurnal birds, particularly the Pied Currawong and many parrot species (DECCW 2010). Scansorial and terrestrial mammals (particularly rats) are also recorded in Powerful Owl pellets, although rarely (DECCW 2010).

Recent conservation research on large forest owls identified that fragmentation of native vegetation within urban development has a greater impact on the Powerful Owl and their arboreal marsupial prey than logging (Kavanagh & Stanton 2000). The study also identified that habitat fragments smaller than 200 hectares do not provide significant reservoirs for Powerful Owl populations.

Recent work has found this species in higher densities more widespread in the sandstone reserves around Sydney than previously thought and in the Greater Southern Sydney Region, this species is considered to be a common and stable resident (DECC 2007b).

DECCCW has also recently undertaken targeted and systematic survey of other priority areas, including northern Yengo National Park (DEC 2005) and southern Yengo National Park and Parr State Conservation Area (DECC 2008). The subject site is not within the study area of this latter report and so its findings are irrelevant.

In the Yengo and Parr areas, this species was found to be widespread, albeit at lower densities than occur in the nearby wetter coastal habitats such as in Jilliby State Conservation Area (DECC 2008).

This species was not recorded on the subject site. Marginal foraging habitat for this species

occurs on the subject site in the open forest canopy.

(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,

Response:

Habitat features critical to the life cycle of this species include foraging resources and breeding sites (large tree hollows). There are no hollows suitable for this species on the subject site. The site contains some foraging potential with an open understorey. However the area potentially used by this species is small and has limited resources.

Therefore the proposed actions are unlikely to have an adverse effect on this species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(c) 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

Response:

This question is not relevant to a threatened species.

(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,

Response:

This question is not relevant to a threatened species.

(d) 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

Response:

Potential foraging habitat for this species occurs in the 1,210 square metres. Of this 968 square metres will be modified for bushfire protection measures.

(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

Response:

This is a highly mobile species with home ranges of up to 1,000 hectares. The development area is small, and occurs on already disturbed land, jammed between a sea of residential development and a main roadway reserve. Connectivity to the immediately surrounding vegetated lands will not be compromised for this species by the development proposal.

(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,

Response:

The habitat for this species is widely diverse and common in the local area. The development area is tiny in comparison with what is available to this species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

No critical habitat has been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

A number of objectives and strategies for this species have been detailed in the Recovery Plan for the Large Forest Owls (NSWDEC 2005). Of relevance to this proposal are the following objectives:

1. Manage and protect habitat off reserves and State forests - To minimise further loss and fragmentation of habitat outside conservation reserves and State forests by protection and management of significant owl habitat (including protection of individual nest sites);
2. Model and map owl habitat and validate with surveys - To assess the distribution and

amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not, protected; and

3. Monitor owl population parameters - To monitor trends in population parameters (numbers, distribution, territory fidelity and breeding success) across the range of the three species.

The first objective is served by this assessment process with survey conducted for this species and recommendations made for minimisation of potential impact and conservation of important habitat features.

The second and third objectives are served by the conducting of survey for this assessment and the provision of data to the relevant authorities.

This species has also been assigned to the "landscape species" management stream under the NSW Office of Environment and Heritage. The management stream aims to recover the species through:

1. Broad scale vegetation and habitat management programs;
2. Control land clearing through the Native Vegetation Act 2003 and the Environmental Planning and Assessment Act 1979;
3. Water sharing plans for riparian and floodplain species and ecosystems;
4. Coastal management programs, and;
5. Management of National parks and reserves under the National Parks and Wildlife Act 1974.

The proposal is largely consistent with these strategies.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Response:

Recognised threats to this species include (DECCW 2010):

1. Historical loss and fragmentation of suitable forest and woodland habitat from land clearing for residential and agricultural development. This loss also affects the populations of arboreal prey species, particularly the Greater Glider which reduces food availability for the Powerful Owl;
2. Inappropriate forest harvesting practices that have changed forest structure and removed old growth hollow-bearing trees. Loss of hollow-bearing trees reduces the availability of suitable nest sites and prey habitat;
3. Can be extremely sensitive to disturbance around the nest site, particularly during pre-laying, laying and downy chick stages. Disturbance during the breeding period may affect breeding success;
4. High frequency hazard reduction burning may also reduce the longevity of individuals

by affecting prey availability;
5. Road kills;
6. Secondary poisoning; and
7. Predation of fledglings by foxes, dogs and cats.

The proposed works for the building envelope and bushfire protection requirements contributes to the Key Threatening Process "Clearing of Native Vegetation".

The proposal will contribute in a very small way to the Key Threatening Process "Clearing of Native Vegetation"

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Mormopterus norfolkensis Eastern Freetail-bat

The Eastern Freetail-bat is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Eastern Freetail-bat has dark brown to reddish brown fur on the back and is slightly paler below. Like other freetail-bats it has a long (3 - 4 cm) bare tail protruding from the tail membrane (OEH 2015a).

The Eastern Freetail-bat is an insectivore but nothing specific is known about its diet (Churchill 1998, 2008). It is thought that they forage within a few kilometres of their roost (Churchill 2008, Hoye et al. 2008).

It is found along the east coast from south eastern Queensland to southern NSW (OEH 2015a). Most records are from dry eucalypt forest and woodland, although a number have been caught flying low over a rocky river through rainforest and wet sclerophyll forest (Hoye et al. 2008). Research in coastal forests near Coffs Harbour have shown that it is more active on upper slopes where the flyways are open and uncluttered, rather than along creeks (Hoye et al. 2008).

Although it has been recorded roosting in the roof of a hut, under bark and the caps of telegraph poles, it is more usually found in hollows in large mature trees (Churchill 2008). All natural roost sites have been found in large mature eucalypts and they will use paddock trees and remnant vegetation in farmland (Hoye et al. 2008). They will also roost in artificial roosts, with a colony in NSW known to use the same boxes for over 5 years (Churchill 2008).

Young are born in late November or early December and are free-flying by late January (Hoye et al. 2008).

A survey of the fauna of the large sandstone-based reserves around the northern Sydney fringe found that this species was infrequently recorded within these reserves and it is thought that they may prefer the larger alluvial valleys and coastal plains (DEC 2005, DECC 2008).

This species was not recorded on the subject site. potential habitat for this species occurs on site with tree hollows occurring within the APZ.

(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,

Response*:*

The subject site provides both foraging habitat for this species and potential breeding sites (hollow-bearing trees). Suitable hollows to be removed will be compensated for with

replacement nest boxes. The potential and realised habitat on site would only represent a very small proportion of what is available locally and regionally as this species is highly mobile, able to exploit widely separated resources.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response*:*

This question is not relevant to a threatened species.

(c) 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

Response*:*

This question is not relevant to a threatened species.

(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,

Response*:*

This question is not relevant to a threatened species.

(d) 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

Response*:*

Approximately 968 square metres of potential foraging habitat is to be removed or modified, including 1 dead hollow bearing tree. The loss of potential roosting habitat will be compensated for the installation of a replacement nest box. the loss of potential foraging habitat is a small area in relation to the local resources available.

(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

Response*:*

This is a highly mobile species able to exploit widely separated resources. The proposal is unlikely to prevent this species from moving around the landscape or accessing required resources. Moreover, the proposal has been designed specifically so that the eastern and northern corridors will remain.

(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,

Response*:*

It is unlikely that the poor quality foraging habitat on site is an important resource for a local population of this species. However, the loss of a dead hollow-bearing tree has a greater chance of adverse impact, although a study of roost sites used by this species found all in living healthy trees (McConville and Law 2013). 2 small hollows will remain within the APZ and a nest box is to be erected in lieu of the dead hollow bearing tree.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response*:*

No critical habitat has been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response*:*

The Department of Environment and Conservation has a prepared Priority Action Statement to promote the recovery of the species. A total of 19 priority actions have been identified and dividing into priorities of High, medium and Low (OEH 2015b).

The following Priority Actions have been classified as being of high priority (OEH 2015b):

1. Ensure the largest hollow bearing trees, inc. dead trees and paddock trees, are given highest priority for retention in PVP assessments. Offsets should include remnants in high productivity.
2. Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts.
3. Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal.
4. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.

5. Identify the effects of fragmentation in a range of fragmented landscapes i.e. the farmland/forest interface and the urban/forest interface e.g. movement and persistence across a range of fragment sizes.
6. Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.
7. Promote the conservation of these private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.

The following Priority Actions have been classified as being of medium and low priority (OEH 2015b):

1. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
2. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
3. Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees.
4. Identify important foraging range and key habitat components for this species.
5. Identify the susceptibility of the species to pesticides.
6. Better define species distribution through survey in coastal lowlands on- and off-reserve.
7. Research the effect of different burning regimes.
8. Investigate the effectiveness of logging prescriptions.
9. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.
10. Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species.
11. Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Retain hollow-bearing trees and provide for hollow tree recruitment.\;
2. Retain foraging habitat; and
3. Minimise the use of pesticides in foraging areas.

1 dead hollow bearing tree is to be removed as part of the bushfire control measures within the APZ. 2 healthy hollows will remain and a nest box is to be installed to maintain the quantity of hollows on site. The proposal therefore is largely consistent with the recovery strategies.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Response*:*

The proposal contributes to the relevant Key Threatening Processes "Clearing of Native Vegetation" and "Loss of Hollow-bearing Trees".

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***Miniopterus orianae oceanensis* Eastern Bent-wing Bat**

The Eastern Bent-wing Bat is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Eastern Bent-wing Bat has been identified as a result of revision to the taxonomy of the Common Bent-wing Bat (*Miniopterus orianaei*). The Eastern Bent-wing Bat closely resembles the Little Bentwing-bat, however is larger (Strahan 1995). This species is distributed along the east and North West coasts of Australia (OEH 2015a). Its range extends along the entire east coast of Australia, with a gap forming along the Gulf of Carpentaria, where records begin again in the Kimberley (Churchill 1998).

Primary roost sites include caves with colonies reaching thousands in number (Strahan 1995), however they also use other man-made structures such as abandoned mines and road culverts (Churchill 2008). The 12 maternity roosts that are known to throughout the range of this species are located in limestone and sandstone caves, abandoned gold mines, concrete bunkers and lava tubes (Hoye and Hall 2008).

In the southern, non-tropical parts of its range mating occurs in early winter but implantation is delayed until August. After mating and with the onset of spring, adult females move from numerous widely scattered roosts to specific nursery caves where the young are born and reared to independence. Here they form discrete populations of pregnant females, non-breeding females and juvenile males at a maternity cave in the spring and summer (Hoye and Hall 2008).

Particular nursery caves will be used repeatedly year after year and may number from 100 to 150,000 individuals (OEH 2015a). Nursery colonies disband between February and March, adults and juveniles going separate ways, and will disperse up to 300 kilometres from the maternity cave (OEH 2015a). These bats are strong fliers and often travel long distances, with one individual recorded moving 1,300 km (Dwyer 1969).

Overwintering roosts depend on the sex and age of individuals with bats often selecting cool areas located within caves, mines, tunnels, drains and bridges during the colder months of the year when insects are few (Hoye and Hall 2008). In such sites they may enter periodic torpor as an energy-saving strategy, reducing their metabolic temperatures and prolong fat reserves over winter (Churchill 1998). In the tropical areas, however, diurnal shelter sites may be found in roofs of buildings (Hoye and Hall 2008). This species is known to roost with Miniopterus australis Little Bentwing-bat (Hoye and Hall 2008). Just such a communal roost site is thought to occur in the sea cliffs near Avoca Beach on the Central Coast (Ray Williams, personal communication).

It has a fast and direct flight (Hoye and Hall 2008) and can reportedly travel up to 65 kilometres in a night (Dwyer 1966). It forages principally on moths, usually snatched high above the forest canopy, although it can also forage low to the ground over open grassy areas (Churchill 1998, 2008) and along waterways and tracks (Hoye and Hall 2008). It also regularly

forages around street lights and may be active throughout winter in coastal locations (Hoye and Hall 2008).

This species is vulnerable to losses of maternity sites and increased mortality is observed at overwintering roosts that are frequently disturbed (Hoye and Hall 2008). Foxes and cats are major predators (Hoye and Hall 2008), and bats overwintering in urban areas show high levels of injury from collisions with cars and trains, flooding and other urban hazards (Hoye and Spence 2004).

The vertebrate fauna of the large sandstone-based reserves around the Sydney fringe are relatively poorly known and so DECCCW has recently undertaken targeted and systematic survey of priority areas, including northern Yengo National Park (DEC 2005) and southern Yengo National Park and Parr State Conservation Area (DECC 2008). The subject site is not within the study area of this latter report and so its findings are irrelevant.

This species was recorded on several occasions as part of that study but no maternity roosts have been located. Relevantly, a roost site of a group of four bats was located under an overhang on Little Mogo Creek (DECC 2008).

This species was not recorded on the subject site. Habitat for this species occurs on the subject site within the current buildings and forested area within the APZ.

(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,

Response:

Critical habitat features for this species are the caves used for roosting and breeding. There are no such features on the site. The proposal will minimally modify the potential foraging habitat on the site. Therefore the proposal will not adversely effect the long-term viability of this species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(c) 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

Response:

This question is not relevant to a threatened species.

(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,

Response:

This question is not relevant to a threatened species.

(d) 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

Response:

Potential roosting habitat for this species will be removed with the demolition of the current buildings. 968 square metres of potential foraging habitat for this species will be modified for bushfire control measures.

(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

Response:

This is a highly mobile species that can exploit widely-separated resources. The proposed development is restricted to current residential lands and a small strip of vegetation dividing residential housing from Henry Parry Drive. The level of fragmentation of habitat will not be exacerbated by the proposal.

(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,

Response:

Important habitat for this species is either close to maternity caves or contain non-breeding roost sites. The subject site does not fulfil these criteria.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

No critical habitat has been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

There is no recovery plan or threat abatement plan for this species. However, it has been assigned to the "landscape-managed" management stream by the Office of Environment and Heritage, as it is distributed across a large area, is highly mobile and threatened across the landscape by habitat loss and degradation (OEH 2015b). The following management actions have been identified for this species as part of that process (OEH 2015b):

- Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels.
- Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.
- Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts.
- Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures.
- Ensure protection of known roosts and forest within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments.
- Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies.
- Restrict caving activities at significant roosts during important stages of the annual bat life cycle (eg winter hibernation, summer maternity season).
- Identify and protect significant roost habitat in artificial structures (eg culverts, old buildings and derelict mines).
- Identify the susceptibility of the species to pesticides.
- Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.
- Restrict access where possible to known maternity sites. (e.g.: signs; bat-friendly, preferably external gates at caves).
- Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts.
- Establish a gating design for disused mines across species range that will not adversely impact species. Consultation with cave bat specialist prior to any gating operations.
- Determine the effectiveness of PVP assessment, offsets and actions for bats.
- Monitor the breeding success of a representative sample of maternity colonies in cave roosts over a number of years to determine the viability of regional populations.

- Regular censuses of maternity colonies (Wee Jasper, Bungonia, Willi-Willi, Riverton) and other key roosts in network, especially where there are population estimates from banding in the 1960s.
- For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays.
- Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction.
- Research the effect of different burning regimes on cave disturbance and surrounding foraging habitat.
- Study the ecological requirements of maternity colonies and their environs and migratory patterns.
- Research to identify important foraging range and key habitat components around significant roosts.
- Confirm species taxonomy of NSW populations, relative to other Australian populations.
- Search for significant roost sites and restrict access where possible. Significant includes maternity, hibernation and transient sites including in artificial structures. .
- Compile register of all known roost sites in natural and artificial structures including current and historical data and identify signifance of roost, e.g. maternity, hibernation, transient roost.
- Promote the conservation of these key roost areas using measures such as incentive funding to landholders, offseting and biobanking, acquisition for reserve establishment or other means

A number of specific recovery activities have also been identified (OEH 2015a):

- Control foxes and feral cats around roosting sites, particularly maternity caves.
- Retain native vegetation around roost sites, particularly within 300 m of maternity caves.
- Minimise the use of pesticides in foraging areas.
- Protect roosting sites from damage or disturbance.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Response:

The proposed works for the building envelope and bushfire protection requirements contributes to the Key Threatening Process "Clearing of Native Vegetation".

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***Miniopterus australis* Little Bentwing-bat**

The Little Bentwing-bat is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Little Bentwing-bat is distinguished from other bentwing-bats by its small size and very long terminal joint in the third digit of the forelimb (Strahan 1995). This species has a distinctively short muzzle and a domed head (Churchill 1998).

These bats have a distribution running along the east coast of Australia from Cape York to northern New South Wales (Churchill 1998). In tropical areas, it ranges from the coast to higher elevations but further south it is largely restricted to the coast (Hoye and Hall 2008).

In the southern part of their range, Little Bentwing-bats may hibernate during winter months (Churchill 1998) but are known to remain active through much of winter, emerging to feed on many nights (Hoye and Hall 2008). It forages via aerial pursuit of small insects (moths, wasps and ants) beneath the canopy of densely-vegetated habitats including rainforest, paperbark swamps and wet and dry sclerophyll forest (Hoye and Hall 2008).

This species roosts communally in caves or similar suitable spaces, often with *Miniopterus orianae oceanensis* Eastern Bentwing-bat (Hoye and Hall 2008) and may form mixed clusters in winter (OEH 2015a). Just such a communal roost site is thought to occur in the sea cliffs near Avoca Beach on the Central Coast (Ray Williams, personal communication). Females gather in large maternity colonies in summer (Menkhorst and Knight 2001), and only five such sites are known across Australia (OEH 2015a). A single young is born in December (Strahan 1995) and males and juveniles disperse in summer (OEH 2015a).

Non-breeding roost sites have included one observation of use of a tree hollow, but it is not known whether this occurs regularly (Hoye and Hall 2008).

The vertebrate fauna of the large sandstone-based reserves around the Sydney fringe have been the subject of systematic and targeted survey, including northern Yengo National Park (DEC 2005) and southern Yengo National Park and Parr State Conservation Area (DECC 2008). The subject site is not within the study area of this latter report and so its findings are irrelevant.

This species was not recorded on the subject site. Foraging habitat for this species occurs on the subject site within the area of APZ with roosting habitat in the current buildings on site.

(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,

Response:

Critical habitat features for this species are the caves used for roosting and breeding. There are no such features in the development area and none known on the subject site. A small amount of potential foraging habitat will be modified, but the overall nature of the site will be unchanged. Therefore the proposal will not adversely affect the long-term viability of this species.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(c) 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

Response:

This question is not relevant to a threatened species.

(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,

Response:

This question is not relevant to a threatened species.

(d) 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

Response:

Approximately 968 sqaure metres potential foraging habitat will be removed or modified.

(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

Response:

The subject site is a small extension of the landscape already disturbed, adjoining previous developments to the north, south and west.. This configuration will not further fragment or isolate potential habitat for this highly mobile species.

(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,

Response:

The development area does not contain breeding or roosting resources for this species. The potential foraging habitat to be modified is comparatively small and will not have an effect on long-term survival for this species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

No critical habitat has been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

This species has been assigned to the "Landscape species" management stream under the NSW Office of Environment and Heritage as it is distributed across relatively large areas and is subject to threatening processes that generally act at the landscape scale (e.g. habitat loss or degradation) rather than at distinct, definable locations (OEH 2015b). The following management actions have been identified for this species as part of that process (OEH 2015b):

- Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels.
- Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.
- Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts.
- Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures.
- Protect significant roosts and forest habitat within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments.
- Promote the conservation of these significant roost areas using measures such as incentive funding to landholders, offseting and biobanking, acquisition for reserve establishment or other means.

- Determine the effectiveness of PVP assessment, offsets and actions for bats.
- Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies.
- Identify and protect significant roost habitat in artificial structures (eg culverts, old buildings and derelict mines).
- Identify the susceptibility of the species to pesticides.
- Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.
- Establish a gateing design for disused mines across species range that will not adversely impact species.
- Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts.
- Restrict access where possible to known maternity sites. (e.g: signs).
- Monitor the breeding success of maternity colonies in cave roosts over a number of years to determine the viability of regional populations.
- Undertake a regular census of maternity colonies (e.g. Willi Willi) and other key roosts in network, especially where there are population estimates from banding in the 1960s.
- For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays.
- Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction.
- Study the effect of different burning regimes on cave disturbance and surrounding foraging habitat.
- Study the ecological requirements of maternity colonies and their environs and migratory patterns.
- Identify important foraging range and key habitat components around significant roosts.
- Identify types of winter roosts used by species. Winter roosts suspected to be banana palms and tree hollows.
- Search for significant roost sites and restrict access where possible. (e.g. gating of caves). Significant includes maternity, hibernation and transient sites including in artificial structures.
- Compile register of all known roost sites in natural and artificial structures including current and historical data and identify signifance of roost, e.g. maternity, hibernation, transient roost.
- Control goats around roosting sites, particularly maternity caves and hibernation sites.

A number of specific recovery activities have also been identified (OEH 2015a):

- Protect known roosting and nursery sites and surrounding forest from disturbance by restricting and/or monitoring access.

- Retain stands of native vegetation, particularly within 10km of roosts.
- Reduce use of pesticides within breeding and foraging habitat.
- Undertake non-chemical weed control to prevent obstruction of maternity cave and other roost entrances.
- Exclude fire from 100m of maternity cave, winter roost or other significant roost entrances and ensure smoke/flames do not enter these roosts.
- Control foxes, feral cats and goats around maternity caves, winter roosts and other significant roost sites.
- Ensure any fencing and gating of roosts is done in a bat friendly manner allowing adequate entrance and exit space for all species using the roost.
- Check with OEH before undertaking recreational caving activities.
- Ensure adequate foraging habitat is retained when undertaking hazard reduction activities, particularly during the breeding/reproduction season.
- Ensure appropriate hygiene protocols are implemented when undertaking research and survey work.

None of the activities associated with the proposal are inconsistent with these recovery actions.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Response:

The proposed works for the building footprint and bushfire protection requirements contributes to the Key Threatening Process "Clearing of Native Vegetation".

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***Falsistrellus tasmaniensis* Eastern False Pipistrelle**

The Eastern False Pipistrelle is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Eastern False Pipistrelle is a large, robust bat with dark to reddish brown fur on the back, and paler grey fur on the belly (Churchill 1998). There is a characteristic notch on the outer margin of the ear, near the tip (Churchill 1998). This species is found from the south east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania (OEH 2015a). Eastern False Pipistrelles inhabit sclerophyll forests east of the Great Dividing Range. They appear to prefer wet high-altitude forests (Law et al. 2008), especially where trees are over 20 metres high (Churchill 1998).

Eastern False Pipistrelles generally roost in small colonies in the trunks of hollow eucalypts; however they have been found roosting in caves and old wooden buildings (Churchill 1998). They apparently hibernate over winter in the southern parts of its range (Phillips 1995).

Flight is swift and direct, often just below or within the tree canopy (Churchill 1998). Radio-tracking studies in Victoria revealed a maximum nightly movement of 13 kilometres between daytime roosts in hollow trees (NSW NPWS no date). The diet of this species appears to be dominated by beetles and one study suggested that the species can preferentially select larger beetles as prey (NSW NPWS no date).

The Eastern False Pipistrelle is a highly mobile species with movements of up to 12 kilometres between roosting and foraging sites (Menkhorst and Lumsden 1995). Single young are born in December (Menkhorst and Knight 2001).

This species was not recorded on the subject site. Habitat for this species occurs on the subject site with a dead tree with cracks suitable for this species and in the current buildings within the works area.

(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,

Response:

Habitat features critical to the life cycle of this species include foraging resources and breeding sites. While some foraging habitat may be disrupted, hollow trees may be retained within the asset protection zones. Given the expanse of available habitat for this species in the local area, and the fact that only 1 hollow tree will be removed, the proposed works are not considered to impose a significant impact on the life cycle stages of this species.

(b) in the case of an endangered population, whether the action proposed is likely to have

an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(c) 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

Response:

This question is not relevant to a threatened species.

(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,

Response:

This question is not relevant to a threatened species.

(d) 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

Response:

1 dead hollow bearing tree will be removed within the APZ and the current buildings will be demolished in order to construct the proposed complex. Approximately 968 square metres of potential foraging habitat will be slightly modified within the APZ.

(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

Response:

Potential roosting and foraging habitat for this species occurs within and adjacent to the subject site. This is a highly mobile species able to exploit separated resources, but the proposal will only modify a very small area. Its impact on fragmentation of habitat will be minimal.

(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,

Response:

The importance of modifying such a relatively small area of potential habitat is very low. The local area contains large areas of vegetated lands, farm dams and Narara Creek for foraging and roosting.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

No critical habitat has been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

This species has been assigned to the "landscape species" management stream under the NSW Office of Environment and Heritage. The management stream aims to recover the species through (OEH 2015b):

- Ensure the largest hollow bearing trees (including dead trees) are given highest priority for retention in PVP assessments or other land assessment tools.
- Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.
- Investigate the effectiveness of logging prescriptions.
- Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.
- Identify the effects of fragmentation in a range of fragmented landscapes e.g. cleared Tableland landscapes. For example genetic isolation, movement and persistence across a range of fragment sizes.
- Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species.
- Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value (HCV) planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.
- Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.

- Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
- Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating and installing bat boxes.
- Quantify any benefits to local bat populations from reducing the impact of insect pests on commercial crops. .
- Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees. .
- Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts. .
- Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal.
- Identify important foraging range and key habitat components for this species.
- Research the effect of different burning regimes.

Of relevance are the following (OEH 2015a):

- Retain native vegetation that is floristically and structurally diverse.
- Minimise the use of pesticides within or adjacent to areas where insectivorous bats occur.
- Protect roost sites from disturbance.

The proposal is largely consistent with these recovery strategies.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Response:

The proposed works for the building envelopes and bushfire protection requirements contributes to the Key Threatening Process "Clearing of Native Vegetation" and "Loss of Hollow bearing Trees".

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