ANNEXURE 2

Flora & Fauna Assessment

prepared by

Southeast Engineering and Environmental

ANNEXURE 2

Flora and Fauna Impact Assessment:

43 Old Saddleback Road, Kiama (Lot 20 DP 1151501)

Planning proposal to correct zoning anomaly

Report prepared for
Cowman Stoddart P/L
PO Box 738 NOWRA NSW 2541

8 April 2013

Prepared by

southeast
engineering+environmental

a: PO Box 96 Moruya NSW 2537
t: 02 4474 4439, **m:** 042 999 8956
e: mark@south-east.com.au

Document Verification

Document title: Flora and Fauna Impact Assessment: 43 Old Saddleback Road, Kiama (Lot 20 DP 1151501) - Planning proposal to correct zoning anomaly.

Client Contact: Stephen Richardson (Cowman Stoddart P/L)

Project number: 167

Prepare by: Mark Harris and David Bain

Issue and date: Final v2 (corrected address) 08/04/2013

Issue to: Stephen Richardson

Document history: Draft 1 26/03/2013, Final 03/04/2013

Contents

1.0 Introduction

1.1 Site location and proposed activities covered by this impact assessment

The subject site is located within 43 Old Saddleback Road, Kiama (Figure 1-1). This impact assessment covers the proposed correction of a zoning anomaly within Lot 20 DP 1151501 by rezoning a small parcel of land (heron referred to as 'the sliver') (1420sqm), from RU2 Rural Landscape to R2 Low Density Residential to rationalise the zoning and make the sliver consistent with the rest of the majority of the Lot.

The broader study area, which takes in adjacent areas with potential to be impacted, is shown in Figure 1-2.

Figure 1-1 Site location. Dashed red outline = subject property; Yellow outline = zoning anomaly (image source NSW LPI SIX Mapper)

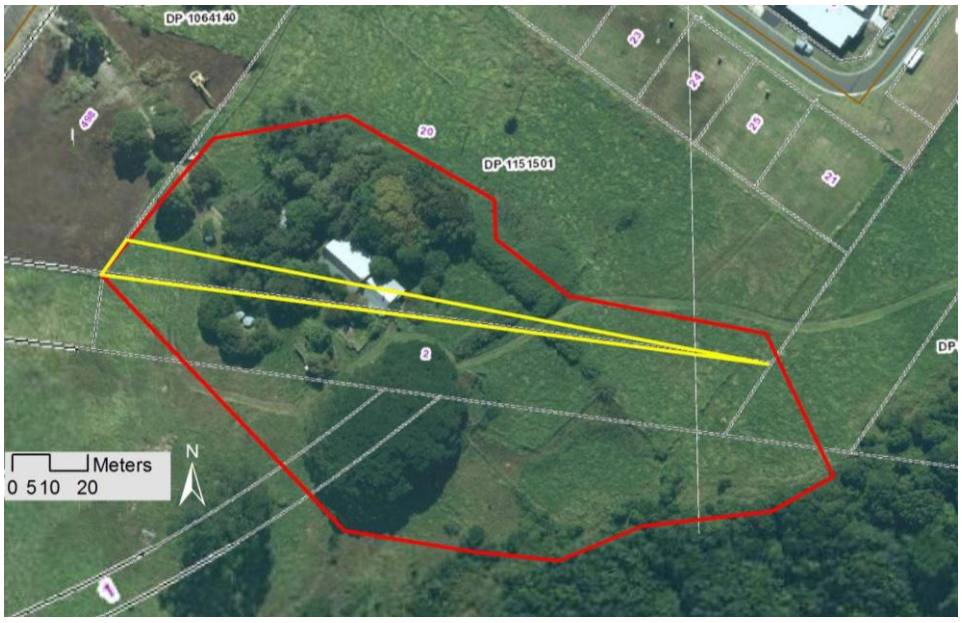


Figure 1-2 Study area covered by this assessment. Red outline = study area; yellow outline = zoning anomaly (image source NSW LPI SIX Mapper)

1.2 Aims of this study

The aims of this study are to provide:

- A list of legislation/approvals pertinent to threatened flora and fauna.
- A list of the flora and fauna species recorded during the field survey.
- Details of the vegetation communities and fauna habitats present, including information regarding disturbance, the surrounding matrix and potential fauna movement corridors.
- An evaluation of the likelihood of occurrence for threatened flora and fauna species, migratory fauna species and endangered fauna populations based on the presence of habitat, proximity to nearest records and the mobility of species.
- Assessments of the likely impacts associated with the proposed activity pursuant to the NSW Threatened Species Conservation Act 1995 (TSC Act) and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

2.0 Planning context

2.1 Threatened Species Conservation Act 1995

The Threatened Species Conservation Act 1995 (TSC Act) specifies seven factors which must be considered by decision-makers regarding the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats (DECC 2007). These factors form part of the threatened species assessment process under the Environmental Planning and Assessment Act 1979 (EP&A Act) and are formally named the Assessment of Significance (informally known as the 'Seven-part Test') (DECC 2007).

Consent authorities have a statutory obligation, under Part 4 of the EP&A Act, to consider whether a proposal is likely to significantly affect threatened species, populations or ecological communities, or their habitats by applying the Seven-part Test. If the determination is made that there is likely to be a significant effect then either;

- A Species Impact Statement (SIS) must be prepared and the concurrence of the Director-General of the Department of Environment, Climate Change and Water (DECCW) obtained prior to the consent authority making a determination, or
- The proposal may be modified such that a significant effect on threatened species, populations or ecological communities, or their habitats is unlikely (DEC 2004).

This report applies the Seven-part Test to threatened entities which may potentially be impacted by the proposal in order to determine the significance of the potential impact.

2.2 Environment Protection & Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) enables the Australian Government to join with the states and territories in providing a national scheme of environment and heritage protection and biodiversity conservation.

Under the EPBC Act, actions that have, or are likely to have a significant impact on a matter of National Environmental Significance (NES) require approval from the Australian Government Minister for the Environment, Heritage and the Arts (DEWHA 2009).

The seven matters of NES that are protected under the EPBC Act are:

- World heritage properties
- National heritage places
- Wetlands of international importance
- Listed threatened species and ecological communities
- Migratory species protection under international agreements
- Commonwealth marine areas
- Nuclear actions including uranium mines.

This report provides an assessment of relevant NES matters to ascertain where the proposed activity will require referral to the Commonwealth.

2.3 Native Vegetation Act 2003

The sliver of land subject to this assessment is currently zoned RU2 Rural Landscape. Therefore, it is subject to the NV Act.

However, this study has shown that the sliver is comprised of highly modified vegetation in the form of exotic pasture and a garden dominated by non-native trees. Based on the definition of native vegetation under the NV Act (below), no parts of sliver of land can be classified as native vegetation. Furthermore, the vegetation does not match any of the Biometric vegetation types, as used for native vegetation planning in NSW.

Native vegetation definition

A simplified definition of native vegetation, in accordance with the NV Act, is where:

- Groundcover comprises greater than 50% live indigenous species, and 10% or more of the area has some form of vegetative cover whether dead or alive, OR
- Indigenous species overstorey percent-cover is at least 25% of the corresponding vegetation class benchmark.

2.4 State Environmental Planning Policy No 44 - Koala Habitat Assessment

The Kiama LGA is not listed on Schedule 1 of SEPP 44. As such, assessment of Koala Habitat is not required.

3.0 Methods

Given the time of year of assessment and the nature of the activity (rezoning), the existing land use and the focus of this report, extended comprehensive surveys were not undertaken. The following sections detail the survey methods applied.

3.1 Database and Literature Review

Databases and other sources that were interrogated to generate a list of species that have been recorded within 5km of the study area include:

- The BioNet Atlas of NSW Wildlife – searched on the 7th March 2013
- The EPBC Act Protected Matters Search Tool – searched on the 7th March 2013

Threatened and migratory species, threatened populations and Endangered Ecological Communities (EECs) that have been recorded within the locality have been assessed for their likelihood to occur within the study area (Appendix 1). All listed species and EECs considered likely to occur within the subject site, or to be affected by the proposal, require consideration pursuant to Section 5A of the (EPA Act) and the EPBC Act where applicable.

3.2 Flora Surveys

A general flora random meander transect around the impact area of the site was undertaken over 3.0 person hours on the 8th March 2013 by Senior Ecologist Dr David Bain. All flora species encountered along the length of the random meander traverse were identified to the genus and species level where practicable. Some species were sampled in the field and identified later using various references. The vegetation community was also described and compared with existing mapping and community descriptions (Mills 2006 and the Biometric vegetation types database).

From database searches, several threatened flora species were known from along the creekline nearby the site. As a result a small search for threatened species and a survey of dominant flora species was also undertaken along the creek margin adjacent to the site.

Limitations

The floristic audit undertaken recorded as many species as possible and provides a comprehensive but not definitive species list. More species would probably be recorded during a longer survey over various seasons.

Nevertheless, the techniques used in this investigation are considered adequate to gather the data necessary to assess the impacts of the proposal on the flora species and vegetation communities found in the study area.

3.3 Fauna Surveys

Only limited fauna surveys have been undertaken due to the small size and projected level of disturbance on the site. As a result, all threatened species not surveyed for but considered potential to occur on the site have been assumed to be present for the assessment of significance of impact from the proposal.

Spotlighting

Spotlighting was undertaken for a total of 0.5 person hours on one night (8th March 2013) for nocturnal species, primarily mammals. This method involved a random meander traverse across the site concentrating on those areas of potential impact.

Call playback
Call playback was used to survey for the following owl species; Powerful Owl, Masked Owl, Barking Owl and Sooty Owl; and the Green and Golden Bell Frog. Call playback was undertaken on one night (8th March 2013) and involved playing calls for two minutes followed by a five minute listening period, repeated twice.

Anabat
Microchiropteran bats were surveyed using an Anabat echolocation device. It was hand held for a total of 0.5 person hours on one night (8th March 2013) during a random meander traverse across the site concentrating on those areas of potential impact. Recorded Anabat files were analysed by Steve Sass of Envirokey P/L, using the software package AnalookW.

Opportunistic
Opportunistic records of fauna were recorded during the site visit, this predominately included diurnal birds and reptiles. Some emphasis was placed on searches for scats, tracks, burrows, diggings and scratching.

Limitations
The results of fauna surveys can be optimised by conducting investigations over a long period to compensate for the effect of unfavourable weather, seasonal changes and climatic variation. In general, the longer the survey the more species will be detected. Results can also be improved by using a wide range of techniques, since some species are more likely to be detected by a particular method.

However, surveys are subject to constraints that determine the amount of time allocated, the methods used and the timing of the work. Thus, the results should be viewed in the light of these limitations. The fauna detected in current survey work are a guide to the native fauna present, but are by no means a definitive list of the species occurring in the study area.

Nevertheless, the techniques used in this investigation are considered adequate to gather the data necessary to assess the impacts of the proposal on the fauna species and habitats found in the study area.

3.3.1 Habitat Surveys

During all surveys of the site habitat features were recorded where observed. Specific searches were conducted for habitats or resources of relevance for those threatened fauna species known from the general region, or species, which might be anticipated to occur given the vegetation communities and habitats present. A description of the fauna habitats in the study area was prepared because the type of habitat in an area influences which animals occur there, as well as diversity and abundance. This habitat assessment also has an important role in predicting threatened fauna likely to occur in an area. Habitat features that were surveyed included:

- forage resources (i.e. koala primary browse trees, sap feed trees, flowering trees and shrubs and feed trees for Glossy Black-cockatoos);
- connectivity across the landscape;
- presence of hollow bearing trees;
- presence of standing or flowing water bodies; and
- disturbance history.

4.0 Results

4.1 Database and Literature Review

Appendix 1 and Appendix 2 provide lists of threatened flora and fauna species that have been recorded from data base searches within a 5km radius of the study area. In these tables the habitat characteristics of these species have been evaluated to determine their likelihood to occur within the study area. Those species identified from the field survey or considered likely to occur form part of the assessment according to Section 5A of the EPA Act and the assessment of significance of matters of National Environmental Significance under the EPBC Act.

4.2 Flora Surveys

4.2.1 Species

A total of 73 flora species were recorded within the study area during the field survey, approximately half of which were not native to the area (Table 4-1).

Table 4-1 Flora species inventory for the study area per vegetation zone (see vegetation map). # Only the dominant species and species of interest were recorded from the creek area.

^^ = listed threatened species; ** = Australian species not native to the area;

Scientific Name	Common Name	Grass	House	Creek#
NATIVE				
Acacia implexa	Hickory Wattle		x	
Acacia longifolia var. *longifolia*				x
Acmena smithii	Lilly Pilly		x	
Anisopogon avenaceus	Oat Speargrass		x	
Baloghia inophylla	Brush Bloodwood		x	
Banksia integrifolia	Coast Banksia		x	
Banksia paludosa	Swamp Banksia		x	
Brachychiton acerifolius	Illawarra Flame Tree		x	
Breynia oblongifolia	Coffee Bush		x	
Callistemon citrinus	Crimson Bottlebrush		x	
Callistemon subulatus			x	
Ceratopetalum apetalum	Coachwood		x	
Ceratopetalum gummiferum	Christmas Bush		x	
Citriobatus pauciflorus	Orange Thorn		x	
*Cynanchum elegans^^*	White-flowered Wax Plant			x
Cynodon dactylon	Common Couch	x	x	
Eucalyptus botryoides	Bangalay		x	
Eucalyptus fibrosa	Red Ironbark		x	
Ficus macrophylla			x	
Geitonoplesium cymosum	Scrambling Lily			x
Geranium homeanum		x	x	
Glochidion ferdinandi	Cheese Tree		x	
Hibbertia scandens	Climbing Guinea Flower		x	x
Leucopogon juniperinus	Prickly Beard-heath			x
Marsdenia rostrata	Common Milk Vine		x	
Melaleuca ericifolia	Swamp Paperbark		x	
Melaleuca quinquenervia	Broad-leaved Paperbark		x	
Melia azedarach	White Cedar		x	

Scientific Name	Common Name	Grass	House	Creek[#]
Myrsine howittiana	Brush Muttonwood		x	
Omalanthus populifolius	Bleeding Heart, Native Poplar	x		
Pandorea pandorana	Wonga Wonga Vine		x	
Panicum simile	Two-colour Panic		x	
Pittosporum undulatum	Sweet Pittosporum		x	x
Pteridium esculentum	Bracken			x
Rubus rosifolius var. *rosifolius*	Native Raspberry		x	
Rumex brownii	Swamp Dock		x	
Toona ciliata	Red Cedar		x	
Urtica incisa	Stinging Nettle		x	
*Zieria granulata^^*	Illawarra Zieria			x
EXOTIC				
Acer pseudoplatanus	Sycamore Maple		x	
Aegopodium sp.		x		
Agapanthus praecox	Agapanthus		x	
*Agonis flexuosa***			x	
Bidens pilosa	Cobbler's Pegs		x	
Camellia japonica	Camellia		x	
Canna x generalis			x	
Cinnamomum camphora	Camphor Laurel		x	x
Cirsium vulgare	Spear Thistle		x	
Convolvulus arvensis			x	
Conyza bonariensis	Flaxleaf Fleabane	x	x	x
Delairea odorata	Cape Ivy		x	x
Gamolepis chrysanthemoides			x	
Gleditsia triacanthos	Honey Locust		x	
*Grevillea robusta***	Silky Oak		x	
Hedychium gardneranum			x	
Jacaranda mimosifolia	Jacaranda		x	
Lantana camara	Lantana	x	x	x
Ligustrum lucidum	Large-leaved Privet			x
Melaleuca sp.**	Horticultural variety		x	
Olea europaea	Common Olive		x	x
Paspalum dilatatum	Paspalum	x	x	x
Pennisetum clandestinum	Kikuyu Grass	x	x	x
Phytolacca octandra	Inkweed		x	x
Rubus ulmifolius	Blackberry			x
*Schefflera actinophylla***	Umbrella Tree		x	x
Schinus molle	Pepper Tree		x	
Senecio madagascariensis	Fireweed	x	x	x
Sida rhombifolia	Paddy's Lucerne	x	x	
Solanum chenopodinum			x	
Solanum mauritianum	Wild Tobacco Bush		x	
Sonchus oleraceus	Common Sowthistle	x	x	x
Tecoma capensis	Cape Honeysuckle		x	x
Tradescantia fluminensis	Wandering Jew		x	

4.2.2 Vegetation communities

The vegetation across the site is highly disturbed, with the majority previously cleared and dominated by introduced species (e.g. site photograph in Figure 4-1). Three vegetation zones were mapped within the study area: grass, house, and creek vegetation (Figure 4-2).

The grass area was highly disturbed and represented previously cleared native vegetation. This vegetation zone was almost solely comprised of introduced species and dominated by *Pennisetum clandestinum* and *Paspalum dilatatum*.

The vegetation surrounding the house can be considered a disturbed variant of Complex Subtropical Rainforest (COM-SRF) from Mills (2006). This vegetation zone contained some of the species associated with this rainforest vegetation community such as *Baloghia inophylla*, *Brachychiton acerifolius*, *Ficus macrophylla* and *Toona ciliata*. However, the zone is highly disturbed with weeds such as *Lantana camara* and *Tecoma capensis* along the fence lines and much of the vegetation modified as the domestic garden for the house. The understorey is largely horticultural garden species such as *Agapanthus praecox* and *Hedychium gardneranum.* Some of the canopy species like *Acer pseudoplatanus* are also evidence of the domestic nature of the vegetation. Much of the vegetation surrounding the house is likely historically part of the EEC Illawarra Subtropical Rainforest in the Sydney Basin Bioregion, although now due to the high level of disturbance and cultivation the vegetation no longer represents this EEC.

The creek area adjacent to the site is mapped as Complex Subtropical Rainforest (COM-SRF) in Mills (2006) which is consistent with the EEC Illawarra Subtropical Rainforest in the Sydney Basin Bioregion. This creekline vegetation is also highly disturbed and modified, being dominated by *Acacia longifolia var. longifolia*, *Pittosporum undulatum* and the introduced *Lantana camara* and *Ligustrum lucidum*. Importantly, two threatened flora species were identified within this community.

4.2.3 Threatened flora species

No threatened flora species, listed on the TSC Act or the EPBC Act, were recorded within the subject land.

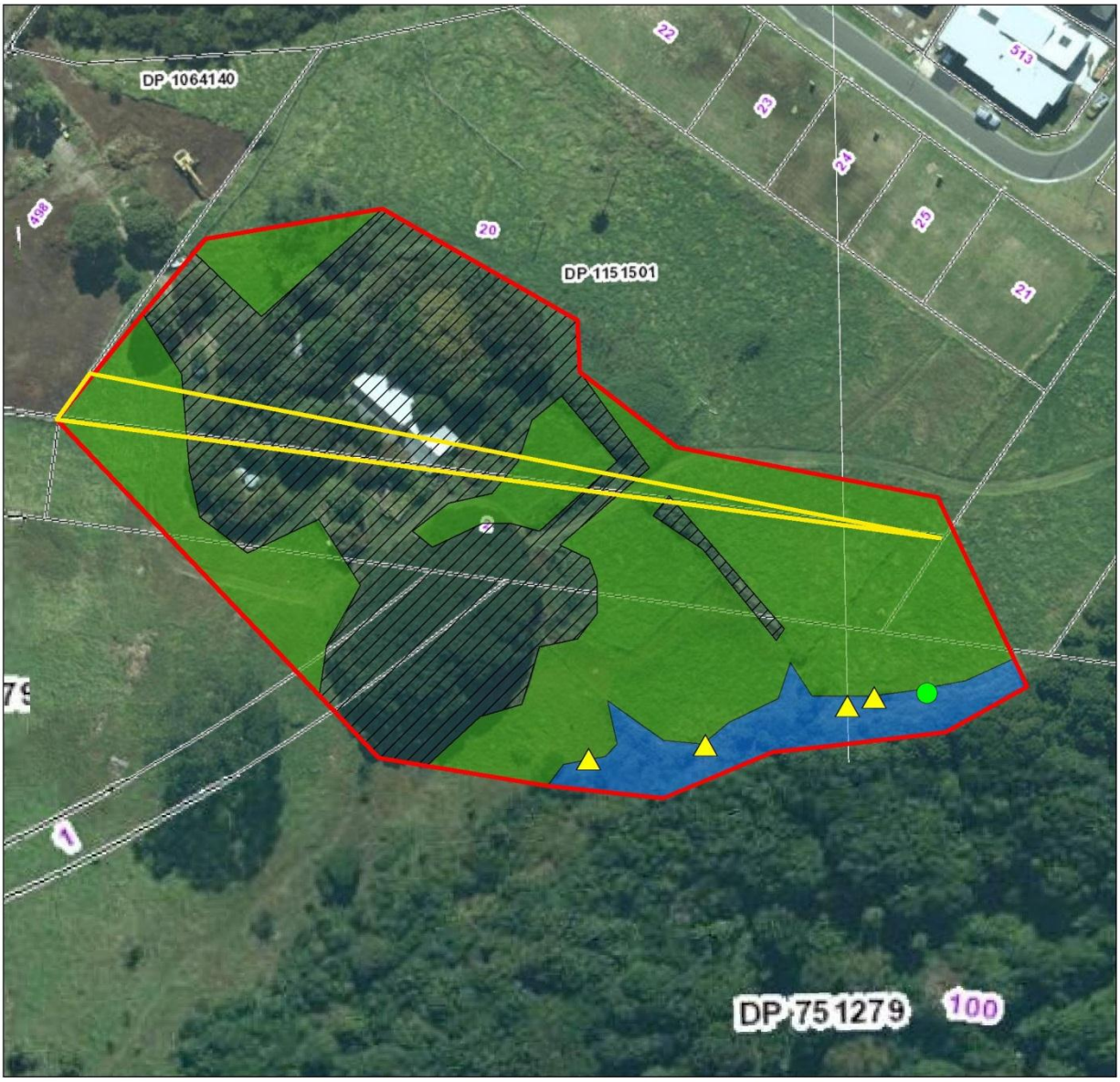
Two endangered flora species, *Cynanchum elegans* and *Zieria granulata* were found adjacent to the site along the creekline (Figure 4-2). The proposed action involves the rezoning of a sliver of land only and does not involve any physical actions that could impact on these species. Any future development applications on this land need to take these individuals of these species into consideration.

Refer to the likelihood of occurrence table (Appendix 1) for further detail regarding threatened flora species known or predicted to occur in the locality.

4.2.4 EEC determination

No EECs were recorded on site. The vegetation around the house was likely historically part of the EEC *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion*, although now due to the high level of disturbance and domestic garden cultivation the community no longer represents this EEC. The adjacent creekline vegetation is mapped as the EEC *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion*. As this vegetation is not actually on the site it is discussed in terms of potential impact but not formally assessed within this report.

Figure 4-1 Showing exotic pasture and garden vegetation surrounding the house.



Legend

Vegetation type

- Creek
- Grass
- House

- Sliver
- Study area

Threatened flora species

- Cynanchum elegans
- Zieria granulata

Datum, projection: GDA 1994, MGA zone 56

Data sources.
Aerial image: NSW LPI (SIX)
Vegetation: Southeast

Mapping date: March 2013

0 12.5 25 50 Meters

N

southeast
engineering + environmental
16/25 Church Street Moruya NSW 2537, T: (02) 4474 4439

Vegetation of the study area

Figure 4-2 Vegetation map

4.3 Fauna Surveys

As described in the methods, comprehensive fauna surveys were not undertaken. A total of six birds, one mammal, two microchiropteran bats ('microbats') and one reptile were recorded (Table 4-2), including two introduced species. No threatened fauna species were recorded. There was no significant indirect evidence of fauna activity around the site.

The two microbat records were derived from a total of 11 Anabat files recorded during the survey. During analysis of the Anabat data, all files were identified as 'definite' species identifications (rather than 'probable' or possible').

Table 4-2 Fauna species recorded on site. * = introduced species

Scientific Name	Common Name
BIRDS	
Eopsaltria australis	Eastern Yellow Robin
Malurus cyaneus	Superb Fairy-wren
Meliphaga lewinii	Lewin's Honeyeater
Neochmia temporalis	Red-browed Finch
Phylidonyris novaehollandiae	New Holland Honeyeater
Streptopelia chinensis*	Spotted Turtle-Dove
MICROBATS	
Austronomus australis	White-striped Freetail Bat
Chalinolobus gouldii	Gould's Wattled Bat
MAMMALS	
Rattus rattus*	Black Rat
REPTILES	
Eulamprus quoyii	Eastern Water-skink

4.3.1 Habitat surveys

The site is highly disturbed and the majority of the site comprises the garden for the house and the cleared grass area surrounding the house. The vegetation surrounding the house is isolated within the cleared grassed are and not directly connected to any other remnants.

The major habitat resource for potential threatened species on the site was the large *Ficus macrophylla* which would supply a valuable food resource for the Grey-headed Flying-fox. Other threatened rainforest species that have the potential to utilise the resource such as the fruit-doves are considered unlikely to do so due to the isolation from nearby rainforest remnants.

No hollow-bearing trees were recorded nor any feed trees for gliders, Glossy-black Cockatoos or were there any winter flowering tree species. No primary browse trees for Koala were recorded on site.

5.0 Impact assessment

The proposal comprises the rezoning of a sliver of land (1420sqm) on the southern edge of Lot 20 DP1151501 from RU2 Rural Landscape to R2 Low Density Residential to rationalise the zoning and make the sliver consistent with the rest of the majority of the lot. Zone RU2 allows for primary industry, maintaining rural landscape and dwelling houses amongst other uses. Zone R2 allows low density housing and dwelling houses amongst other uses.

This change in zoning of the sliver of land will not have a significant effect on the permissible uses for the overall lot as the majority of the land is already zoned R2. A significant proportion of the RU2 zoned sliver of land proposed for rezoning already incorporates part of the existing dwelling.

The environmental values on the site are not inconsistent with the proposed new zoning of R2. The adjacent property to the west has a new low density residential development being constructed. The major environmental values are currently incorporated as part of the existing dwellings garden or occur along the creek line adjacent to the site.

There are some potential indirect impacts including weed infestation, erosion and sedimentation to the environmental values along the creek line from any potential future development of the site. However, these potential impacts would need to be assessed at that future time and in any case the change in zoning proposed with this assessment will not have a significant effect on the potential for development on the subject land given the majority of the lot is already zoned R2.

The following species in Table 5-1 were considered likely to occur on the site (see likelihood of occurrence tables in Appendix 1) and the potential impact of the proposal on these species has been assessed under relevant legislation. The conclusions of these assessments are provided below under Heading 5.1.1 and Heading 5.1.2).

Table 5-1 Species requiring an assessment of significance

Scientific Name	Common Name	TSC Act	EPBC Act	Occurrence
Mormopterus norfolkensis	East Coast Freetail Bat	V	—	Predicted
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Predicted
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	—	Predicted

E = Endangered, V = Vulnerable, M = Migratory

5.1.1 Conclusion of Seven-Part Test

An Assessment of Significance under Section 5A of the EPA Act was undertaken (Appendix 2) on those species or considered likely to occur on the site. The outcome of this assessment has determined that the proposed action is *'unlikely'* to have a *'significant effect'* on the Eastern Freetail-bat, Grey-headed Flying-fox or Yellow-bellied Sheathtail Bat.

The change in zoning of the small sliver of Lot 20 DP1151501 will not alter future impacts to threatened species or communities due to any potential change of land use. Therefore, this matter will not require referral to the NSW Director General.

5.1.2 Conclusion of EPBC Assessment

An assessment of significance under the EPBC Act was undertaken (Appendix 2) on those species considered likely to occur on the site. The outcome of this assessment has determined that it is unlikely that the action would significantly impact on those threatened species assessed. Therefore, referral to the Commonwealth Minister is not recommended.

5.1.3 SEPP 44 Koala Habitat Assessment

The Kiama LGA is not listed on Schedule 1 of SEPP 44. As such, assessment of koala habitat is not required.

6.0 Conclusion

Threatened flora species and populations

Conclusion: Based on desktop searches, species evaluations, field studies and significance assessments under TSC Act and EPBC Act legislation this assessment has determined that there were no threatened flora species found or likely to occur within the subject land.

Two endangered flora species, *Cynanchum elegans* and *Zieria granulata* were found adjacent to the site along the creek line. The proposed action (involving the rezoning of less than 5% of the subject Lot) will have no impact on these species. Any development applications where there is a potential for indirect impacts to occur need to take these individuals of these species into consideration.

Recommendation: This matter will not require referral to the NSW Director General or the Commonwealth Minster in regards to threatened flora species.

Endangered ecological communities

Conclusion: No EECs occur within the subject land. The EEC *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* is found adjacent to the site along the creek line. The proposed action (involving the rezoning of less than 5% of the subject Lot) will have no impact on this EEC. Any development applications where there is a potential for indirect impacts to occur need to take the local occurrence of this EEC into consideration.

Recommendation: This matter will not require referral to the NSW Director General or the Commonwealth Minster in regards to EECs.

Threatened fauna species

Conclusion: Based on desktop searches, species evaluations, field studies and significance assessments under TSC Act and EPBC Act legislation, this assessment has determined that there are no threatened fauna species issues in relation to the proposed activity.

Recommendation: This matter will not require referral to the NSW Director General or the Commonwealth Minster in regards to threatened fauna species.

7.0 References

Braithwaite, L.W. (1984). 'The identification of conservation areas for possums and gliders within the Eden woodpulp concession district'. In: Smith, A.P and Hume, I. D. (Eds.) Possums and Gliders, Australian Mammal Society, Sydney.

DEC. (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities

Davey, S.M. (1984) 'Habitat preference of arboreal marsupials within a coastal forest in southern New South Wales'. Pp. 509-516 In: Smith, A.P. and Hume, I.D. (Eds.) Possums and Gliders. Australian Mammal Society, Sydneydraft). NSW Department of Environment & Conservation, Hurstville, NSW.

Department of Environment and Conservation NSW (2007) Threatened Species Profiles http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
DEC. (2006) Recovery Plan for the Large Forest owls: Powerful Owl (Ninox strenua), Sooty Owl (Tyto tenebricosa) and Masked Owl (Tyto novaehollandiae). Department of Environment & Climate Change, Hurstville, N.S.W.

DECCW. (2010c) Threatened species, populations and ecological communities of NSW. Department of Environment, Climate Change & Water, Hurstville, N.S.W. www.threatenedspecies.environment.nsw.gov.au.

Department of Environment, Climate Change and Water NSW. 2009. Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus. Prepared by Dr Peggy Eby. Department of Environment, Climate Change and Water NSW, Sydney

Environment Australia (2000) Comprehensive and Regional Assessments for North-East NSW. Report to National Parks and Wildlife Service.

Garnett S. T. & Crowley G. M. (2000) *The Action Plan for Australian Birds 2000*. Environment Australia.

Henry, S.R. and Craig, S.A. (1984) 'Diet, ranging behaviour and social organisation of the Yellow-bellied Glider (Petaurus australis Shaw) in Victoria, in Smith, A.P. and Hume, I.D. (eds) Possums and Gliders, Pp. 331-341, Australian Mammal Society, Sydney.

Kavanagh R. P. (1996) The Breeding Biology and Diet of the Masked Owl *Tyto novaehollandiae* Near Eden, New South Wales. *Emu* **96**.

Kavanagh, R.P. (1984) 'Seasonal changes in habitat use by gliders and possums in southeastern New South Wales', Pp. 527-543 in A.P. Smith & I.D. Hume (eds) Possums and Gliders. Australian Mammal Society, Sydney.

Kavanagh R. P. & Bamkin K. L. (1995) Distribution of nocturnal forest birds and mammals in relation to the logging mosaic in south-eastern New South Wales, Australia. *Biological Conservation* **71**, 41-53.

Kavanagh R. P. & Murray M. (1996) Home Range, Habitat and Behaviour of the Masked Owl *Tyto*

novaehollandiae near Newcastle, New South Wales. *Emu* **96**, 250-7.

Long, K. I. and Nelson, J. L. (2004) Recovery Plan for *Dasyurus maculatus* (Spotted-tailed Quoll) 2005 – 2009. Department of the Environment and Heritage, Canberra

Marchant and Higgins (1993) Handbook of Australian, New Zealand and Antarctic Birds. Oxford University Press, Melbourne.

Mac Nally R. & Horrocks G. (2000) Landscape-scale conservation of an endangered migrant: the Swift Parrot (Lathamus discolor) in its winter range. *Biological Conservation* **92**, 335-43.

Menkhorst P. & Knight F. (2001) A field guide to the mammals of Australia. *Oxford University Press*.

Mills, K. (2006) "The Natural Vegetation in the Municipality of Kiama New South Wales" Kevin Mills & Associates.

Morcombe, M. (2004) Field Guide to Australian Birds, Steve Parish Publishing.
NSW National Parks and Wildlife Service (2003). *Recovery Plan for the Yellow-bellied Glider* (Petaurus australis). NSW National Parks and Wildlife Service, Hurstville

OEH (2012). Vegetation Types Database. http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm. NSW Office of Environment and Heritage, Sydney.

PlantNet (2012) Flora Online species descriptions. Royal Botanical Gardens Trust, Sydney. plantnet.rbgsyd.nsw.gov.au

SCWPC (2013) Protected Matters Search Tool. www.environment.gov.au. Commonwealth Department of Sustainability, Environment, Water, Population and Communities

Swift Parrot Recovery Team (2001). Swift Parrot Recovery Plan. Department of Primary Industries, Water and Environment, Hobart

Appendix 1 – Likelihood of occurrence assessment tables (flora and fauna)

Flora likelihood of occurrence table

Summary of initial assessment to determine the likelihood of occurrence of threatened species, populations and ecological communities in the proposal site.

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- "yes" = the species was or has been observed on the site
- "likely" = a medium to high probability that a species uses the site
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the site
- "no" = habitat on site and in the vicinity is unsuitable for the species.

Disclaimer: Data extracted from the Atlas of NSW Wildlife are only indicative and cannot be considered a comprehensive inventory. E = Endangered; E2 = Endangered Population; V = Vulnerable

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Acacia baueri ssp. *aspera*				Associated with heath and dry eucalypt forest and woodland on sandy soils (Smith and Smith 1995).	No. Unsuitable habitat and not recorded
Arthropteris palisotii		E		The Lesser Creeping Fern grows on trees. North-eastern NSW and also in Queensland. Occurs in rainforest, mainly on tree trunks.	No. Unsuitable habitat and not recorded
Callistemon linearifolius	Netted Bottlebrush	V	—	Grows in dry sclerophyll forest on the coast and adjacent ranges (DECC 2007). *C. linearifolius* has been recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River (DECC 2007).	No. Unsuitable habitat and not recorded
Chamaesyce psammogeton	Sand Spurge	E	—	*C. psammogeton* is a prostrate perennial herb, which grows on foredunes and exposed sites on headlands often with Spinifex (DECC 2007). Flowers in Summer.	No. Unsuitable habitat and not recorded

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Chorizema parviflorum		EP		Erect or ascending shrub to 50 cm high, with a stout rootstock. Leaves are alternate, narrow, 1 to 4 cm long, 1 to 4 mm wide, with a conspicuous midrib. Pea-flowers are yellow with a red centre, borne in loose clusters at the ends of branches (DECC 2005). This endangered population has been recorded from between Austinmer and Albion Park in the LGA's of Wollongong and Shellharbour (DECC 2005). All known sites (excluding the site at Austinmer) occupy woodland or forest dominated by Forest Red Gum (Eucalyptus tereticornis) and/or Woollybutt (E. longifolia). Flowering period is August to January, with seeds maturing from November (DECC 2005). The species is difficult to locate when not in flower, as it is often tangled amongst (and partially concealed by) a grassy understorey (DECC 2005).	No. Unsuitable habitat and not recorded
Cryptostylis hunteriana	*Leafless Tongue Orchid*	V	V	It is known from a range of vegetation communities including swamp-heath and woodland (DECC 2007). The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); where it appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*) (DECC 2007). Bell (2001) has identified Coastal Plains Scribbly Gum Woodland and Coastal Plains Smoothed-barked Apple Woodland as potential habitat on the Central Coast. Flowers between November and February, although may not flower regularly (DECC 2007; Bell 2001).	No. Unsuitable habitat and not recorded
Cynanchum elegans		E	E	Climber or twiner with a variable form (DECC 2007). It occurs in dry rainforest gullies, scrub and scree slopes (NPWS 1997). It prefers the ecotone between dry subtropical rainforest and sclerophyll woodland/forest. However has been found in littoral rainforest; *Leptospermum laevigatum – Banksia integrifolia* subsp *integrifolia* coastal scrub; *Eucalyptus tereticornis* aligned open forest/ woodland; *E. maculata* aligned open forest/woodland; and *Melaleuca armillaris* scrub to open scrub (DECC 2007). Flowers between August and May, peaking in November (DECC 2007). Seeds are unlikely to persist in the seedbank (DECC 2007).	Subject Lot unsuitable due to highly modified and disturbed habitat. Found along nearby creek
Daphnandra johnsonii			E	A medium sized rainforest tree that grows to 20 metres and is capable of prolific suckering. The longevity of the species is not known although, given its clonal nature and the large size of some individuals, it is believed to be a long-lived species (DECC 2005) flowers briefly in September and early October although not all populations or individuals appear to flower each year (DECC 2005).	No Not observed and rainforest not found on site

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Daphnandra sp. C Illawarra		E	E	Rainforest tree to 20 metres tall. Restricted to the Illawarra region where it has been recorded from the local government areas of Shoalhaven, Kiama, Shellharbour and Wollongong (DECC 2005). Occupies the rocky hillsides and gullies of the Illawarra lowlands, occasionally extending onto the upper escarpment slopes (DECC 2005). Associated vegetation includes rainforest and moist eucalypt forest. Associated soils are loams and clay loams derived from volcanic and fertile sedimentary rocks (DECC 2005). Flowers briefly in September and early October with fruits taking 10 to 12 months to mature (DECC 2005).	No Not observed and rainforest not found on site
Distichlis distichophylla	Australia Salt-grass	E		Australian Salt-grass is a spreading perennial grass, in the form of a loose, somewhat prickly clump of spreading underground stems (rhizomes). In its limited NSW range it grows only in coastal situations, except for one existing population at Lake Cargellico. Scattered records are from the areas of Jervis Bay, Bermagui, Wonboyn, Narooma, Bodalla and Nadgee Nature Reserve. It is a coloniser of damp saline soils; found at the edges of salt marshes and on low dunes. Flowers and sets seed in late spring and summer	No. Unsuitable habitat and not recorded
Eucalyptus langleyi	Albatross Mallee	V	V	Poor sandy sites west and south west of Nowra (Brooker and Kleinig 1999); mallee shrubland on poorly drained shallow sand on sandstone (Harden 1994).	No. Unsuitable habitat and not recorded
Genoplesium baueri	Bauer's Midge Orchid	V	-	The species has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the following conservation reserves: Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Grows in sparse sclerophyll forest and moss gardens over sandstone. Flowers Dec to Mar.	No. Unsuitable habitat and not recorded
Haloragis exalata subsp.exalata		V		Square Raspwort occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the central coast, south coast and north-western slopes botanical subdivisions of NSW. Damp places near watercourses (Harden 1994).	No. Not observed, gully edge highly disturbed

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Irenepharsus trypherus		E		Gullies on the coastal escarpment between Wollongong and the Shoalhaven (Harden 1994).	No. Not observed, gully edge highly disturbed
Lastreopsis hispida	Bristly Shield Fern	E		Is rare in NSW with the only recent confirmed records from Mt Wilson in the Blue Mountains. Also occurs in southern Victoria and Tasmania, and is common in New Zealand. Grows in moist humus-rich soils in wet forest and rainforest gullies. At Mt Wilson, associated species include *Ceratopetalum apetalum, Elaeocarpus holopetalus, Fieldia australis, Cyathea australis, Blechnum nudum, B. patersonii* and *Leptopteris fraseri.*	No. Not observed, gully edge highly disturbed
Melaleuca biconvexa	Biconvex Paperbark	V	V	Associated with damp habitats, such as Coastal Narrabeen Moist Forest, Riparian Melaleuca Swamp Woodland (LMCC 2001). This species may occur in dense stands forming a narrow strip adjacent to watercourses, in association with other *Melaleuca* species or as an understorey species in wet forest (NSW Scientific Committee 1998). Flowering occurs over just 3-4 weeks in September and October (DECC 2007).	No. Unsuitable habitat and not recorded
Persoonia bargoensis		E		Associated with woodland to dry sclerophyll forest, on sandstone and clayey laterite on heavier, well-drained, loamy, gravelly soils of the Hawkesbury Sandstone and Wianamatta Shale in the catchments of the Cataract, Cordeaux and Bargo Rivers (NSW Scientific Committee 2000). No suitable habitat present.	No. Unsuitable habitat and not recorded
Phaius australis	Swamp Orchid	E	E	Swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas (DECC 2007).	Unlikely. Not observed and highly disturbed habitat
Pimelea curviflora var curviflora		V		Associated with the Duffys Forest Community, shale lenses on ridges in Hawkesbury sandstone geology (Pittwater Council 2000).	No. Unsuitable habitat and not recorded
Pimelea spicata		E	E	In western Sydney, it occurs on an undulating topography of well structured clay soils, derived from Wianamatta shale (DEC 2004). It is associated with Cumberland Plains Woodland (CPW), in open woodland and grassland often in moist depressions or near creek lines (*Ibid.*). Has been located in disturbed areas that would have previously supported CPW (*Ibid.*).	No. Unsuitable habitat and not recorded
Pomaderris adnata	Sublime Point Pomaderris	E		Known only from one site at Sublime Point, north of Wollongong. Occurs near the edge of the plateau behind the Illawarra escarpment. Associated vegetation is *Eucalyptus sieberi* (Silver-top Ash) - *Corymbia gummifera* (Red Bloodwood) forest with occasional *Hakea salicifolia* (Willow-leaved Hakea). Soil is a sandy loam over sandstone.	No. Unsuitable habitat and not recorded

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pterostylis gibbosa	Illawarra Greenhood	E	E	Associated with seasonally hard setting clay soils with approximately 1000mm of rainfall (NPWS 1997). All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum *Eucalyptus tereticornis*, Wollybutt *E. longifolia* and White Feather Honey-myrtle *Melaleuca decora*. Near Nowra, the species grows in an open forest of Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata*. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri.* The Illawarra Greenhood is a deciduous orchid that is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth. The leaf rosette grows from an underground tuber in late summer, followed by the flower stem in winter and flowers in spring.	No. Unsuitable habitat and not recorded
Pterostylis pulchella	Pretty Greenhood		V	Grows on escarpments close to waterfalls and on moist, sheltered ridges; chiefly from Blue Mtns to Fitzroy Falls. The Waterfall Greenhood is found on cliff faces close to waterfalls and creek banks and mossy rocks alongside running water. Flowers appear from February to May.	No. Unsuitable habitat and not recorded
Pultenaea aristata		V	V	Associated with scrub and heath on sandstone ridge tops and upper slopes of large upland swamps on shallow sandy loams (Keith 1994).	No. Unsuitable habitat and not recorded
Pultenaea baeuerlenii		V		Associated with swamp heath on sandstone (Harden 1994).	No. Unsuitable habitat and not recorded
Pultenaea campbellii	New England Bush-pea	-	V	Restricted to the New England district on the Northern Tablelands. Grows in sclerophyll forests, mainly at medium to high altitudes, on light gravelly sandy stony soils derived from granite.	No. Unsuitable habitat and not recorded
Senna acclinis	Rainforest Cassia	E	—	Grows in or on the edges of subtropical and dry rainforest (DECC 2007).	No. Not observed, gully edge highly disturbed
Solanum celatum	Solanum celatum	E	-	Restricted to an area from Wollongong to just south of Nowra, and west to Bungonia. Majority of records are prior to 1960 and the majority of populations are likely to have been lost to clearing. Grows in rainforest clearings, or in wet sclerophyll forests.	No. Not observed, gully edge highly disturbed

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Streblus pendulinus	Siah's Backbone	—	E	Subsequently, the mainland species *S. brunonianus* has been included with *S. pendulinus.* Siah's Backbone occurs from Cape York Peninsula to Milton, south-east New South Wales (NSW), as well as Norfolk Island. On the Australian mainland, Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 800 m above sea level. The species grows in well developed rainforest, gallery forest and drier, more seasonal rainforest	No. Not observed, gully edge highly disturbed
Syzygium paniculatum	Magenta Lillypilly	V	V	This species occupies a narrow coastal area between Bulahdelah and Conjola State Forests in NSW. On the Central Coast, it occurs on Quaternary gravels, sands, silts and clays, in riparian gallery rainforests and remnant littoral rainforest communities (Payne 1997). In the Ourimbah Creek valley, *S. paniculatum* occurs within gallery rainforest with *Alphitonia excelsa, Acmena smithii, Cryptocarya glaucescens, Toona ciliata, Syzygium oleosum* with emergent *Eucalyptus saligna*. At Wyrrabalong NP, *S. paniculatum* occurs in littoral rainforest as a co-dominant *with Ficus fraseri, Syzygium oleosum, Acmena smithii, Cassine australe*, and *Endiandra sieberi*. Payne (1991) reports that the species appears absent from Terrigal formation shales, on which the gully rainforests occur. *S. paniculatum* is summer flowering (November-February), with the fruits maturing in May (DECC 2007).	No. Not observed, gully edge highly disturbed
Triplarina nowraensis	Nowra Heath Myrtle	E	E	There are five known populations of Nowra Heath Myrtle. Three of these form a cluster to the immediate west of Nowra. A fourth, much smaller population is found 18km south-west of Nowra in the Boolijong Creek Valley. The fifth population is located north of the Shoalhaven River on the plateau above Bundanon. Nowra Heath Myrtle occurs on poorly drained, gently sloping sandstone shelves or along creek lines underlain by Nowra Sandstone. The sites are often either treeless or have a very open tree canopy due to the impeded drainage.	No. Unsuitable habitat and not recorded
Wilsonia backhousei		V		Grows in coastal saltmarshes in the Sydney Region and Jervis Bay (Harden 1990)	No. Unsuitable habitat and not recorded
Wilsonia rotundifolia	Round-leaf Wilsonia	E		Round-leafed Wilsonia is a hairy, prostrate, perennial plant with succulent leaves and woody stems. Round-leafed Wilsonia is known from several sites in the Jervis Bay area, Royal National Park, near Deniliquin and in Lake George and Lake Bathurst. The Lake George population appears to be locally extensive. Also found Western Australia, South Australia and Victoria. Grows in mud in coastal salt marsh and inland saline lakes. Flowers mainly in spring and summer.	No. Unsuitable habitat and not recorded
Zieria baeuerlenii	Bomadary Zieria	E	E	The species occurs in only one location north-west of Nowra. The population occurs in a total of 43 colonies in six discrete clusters. These clusters are confined within a 0.5 km x 1.0 km area of the bushland, and are found on both sides of Bomaderry Creek. Bomaderry Zieria occurs on skeletal sandy loam overlaying sandstone, on a rocky plateau amongst sandstone boulders in either shrubby open forest, shrubby woodland or closed scrub.	No. Unsuitable habitat and not recorded

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Zieria granulata	Illawarra Zieria	E	E	Restricted to the Illawarra region where it is recorded from a number of sites. The species primarily occupies the coastal lowlands between Oak Flats and Toolijooa, in the local government areas of Shellharbour and Kiama. This is a range of approximately 22 kilometres. The typical habitat is dry ridge tops and rocky outcrops on shallow volcanic soils, usually on Bumbo Latite. Less frequently found on the moist slopes of the Illawarra escarpment and in low-lying areas on Quaternary sediments. Associated vegetation includes Bracelet Honey-myrtle *Melaleuca armillaris* scrub, Forest Red Gum *Eucalyptus tereticornis* woodland and rainforest margins, although the species has been recorded from a number of other vegetation types. Much of the natural habitat for the species has been removed and many sites now occupy road verges and paddock edges	Subject Lot unsuitable due to highly modified and disturbed habitat. Found along nearby creek
Zieria tuberculata	Warty Zieria	V		Warty Zieria grows in the Mt Dromedary and Tilba Tilba area. The population in the Cambewarra Mountain area near Nowra is now referable to a separate taxon. The Warty Zieria grows in heath amongst rocky outcrops on rain forest edges and in tall forest and shrubland. The flowers appear from late winter to spring	No. Unsuitable habitat and not recorded
Disclaimer: Data extracted from the Atlas of NSW Wildlife and EPBC Act Protected Matters Report are only indicative and cannot be considered a comprehensive inventory.					

Fauna likelihood of occurrence table

E = Endangered; E2 = Endangered Population; V = Vulnerable; M = Migratory.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Heleioporus australiacus	Giant Burrowing Frog	V	V	Forages in woodlands, wet heath, dry and wet sclerophyll forest (Ehmann 1997). Associated with semi-permanent to ephemeral sand or rock based streams (Ehmann 1997), where the soil is soft and sandy so that burrows can be constructed (Environment Australia 2000).	No. Unsuitable habitat
Litoria aurea	Green and Golden Bell Frog	E	V	This species has been observed utilising a variety of natural and man-made waterbodies (Pyke & White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (DECC 2007). Fast flowing streams are not utilised for breeding purposes by this species (Mahony 1999). Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (DECC 2007). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes–Typha sp. and spikerushes–Eleocharis sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1993). Ponds that are typically inhabited tend to be free from predatory fish such as Mosquito Fish (Gambusia holbrooki) (DECC 2007).	No. Poor habitat and not recorded in surveys
Mixophyes balbus	Stuttering Frog	E	V	A variety of forest habitats from rainforest through wet and moist sclerophyll forest to riparian habitat in dry sclerophyll forest (DECC 2007) that are generally characterised by deep leaf litter or thick cover from understorey vegetation (Ehmann 1997). Breeding habitats are streams and occasionally springs. Not known from streams disturbed by humans (Ehmann 1997) or still water environments (NSW Scientific Committee 2002).	No. Unsuitable habitat
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog		V	Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria (DECC 2007). It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops. It hunts either in shrubs or on the ground. Breeding is triggered by heavy rain and can occur from late winter to autumn, but is most likely to occur in spring when conditions are favourable. Males call from low vegetation close to slow flowing pools. Eggs and tadpoles are mostly found in slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools (DECC 2007).	No. Unsuitable habitat
Pseudophryne australis	Red-crowned Toadlet	V	—	Red-crowned Toadlets are found in steep escarpment areas and plateaus, as well as low undulating ranges with benched outcroppings on Triassic sandstones of the Sydney Basin (DECC 2007). Within these geological formations, this species mainly occupies the upper parts of ridges, usually being restricted to within about 100 metres of the ridgetop. However they may also occur on plateaus or more level rock platforms along the ridgetop (DECC 2007). Associated with open forest to coastal heath (Ehmann 1997). Utilises small ephemeral drainage lines which feed water from the top of the ridge to the perennial creeks below for breeding, and are not usually found in the vicinity of permanent water (Ehmann 1997). Breeding sites are often characterised by clay-derived soils and generally found below the first sandstone escarpment in the talus slope (NPWS 1997).	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
REPTILES					
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Typical sites consist of exposed sandstone outcrops and benching where the vegetation is predominantly woodland, open woodland and/or heath on Triassic sandstone of the Sydney Basin (DECC 2007). They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer (Webb & Shine 1998b). Some of the canopy tree species found to regularly co-occur at known sites include *Corymbia eximia, C. gummifera, Eucalyptus sieberi, E. punctata* and *E.* *piperita* (DECC 2007).	No. Unsuitable habitat
Varanus rosenbergi	Heath Monitor	V		Associated with Sydney sandstone woodland and heath land. Rocks, hollow logs and burrows are utilised for shelter (Environment Australia 2000). Terrestrial termitaria are required for reproduction (King and Green 1999).	No. Unsuitable habitat
DIURNAL BIRDS					
Botaurus poiciloptilus	Australasian Bittern	V	E	Terrestrial wetlands with tall dense vegetation, occasionally estuarine habitats (Marchant & Higgins 1993). Reedbeds, swamps, streams, estuaries (Simpson & Day 1999).	No. Unsuitable habitat
Burhinus grallarius	Bush Stone-curlew	E	—	Associated with dry open woodland with grassy areas, dune scrubs, in savanna areas, the fringes of mangroves, golf courses and open forest / farmland (Pittwater Council 2000; Marchant & Higgins 1993). Forages in areas with fallen timber, leaf litter, little undergrowth and where the grass is short and patchy (Environment Australia 2000; Marchant & Higgins 1993). Is thought to require large tracts of habitat to support breeding, in which there is a preference for relatively undisturbed in lightly disturbed.	No. Unsuitable habitat
Callocephalon fimbriatum	Gang-gang Cockatoo	V	—	During summer in dense, tall, wet forests of mountains and gullies, alpine woodlands (Morcombe 2004). In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages (Shields & Chrome 1992). They sometimes inhabit woodland, farms and suburbs in autumn/winter (Simpson & Day 2004).	No. Unsuitable habitat
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	—	Associated with a variety of forest types containing Allocasuarina species, usually reflecting the poor nutrient status of underlying soils (Environment Australia 2000; NPWS 1997; DECC 2007). Intact drier forest types with less rugged landscapes are preferred (DECC 2007). Nests in large trees with large hollows (Environment Australia 2000).	No. Unsuitable habitat
Circus assimilis	Spotted Harrier	V		The Spotted Harrier occurs throughout the Australian mainland, except in densly forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	No. Unsuitable habitat
Dasyornis brachypterus	Eastern Bristlebird	E	E	Habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understorey; in northern NSW occurs in open forest with tussocky grass understorey; all of these vegetation types are fire prone. Age of habitat since fires (fire-age) is of paramount importance to this species; Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years; however, in the northern NSW population a lack of fire in grassy forest may be detrimental as grassy tussock nesting habitat becomes unsuitable after long periods without fire; northern NSW birds are usually found in habitats burnt five to 10 years previously.	No. Unsuitable habitat
Ephippiorhynchus asiaticus	Black-necked Stork	E	—	Associated with tropical and warm temperate terrestrial wetlands, estuarine and littoral habitats, and occasionally woodlands and grasslands floodplains (Marchant & Higgins 1993). Forages in fresh or saline waters up to 0.5m deep, mainly in open fresh waters, extensive sheets of shallow water over grasslands or sedgeland, mangroves, mudflats, shallow swamps with short emergent vegetation and permanent billabongs and pools on floodplains (Marchant & Higgins 1993; DECC 2007).	No. Unsuitable habitat
Epthianura albifrons	White-fronted Chat	V		The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. Found mostly in temperate to arid climates and very rarely sub-tropical areas, it occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas. Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feedin mainly on flies and beetles caught from or close to the ground. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves.	No. Unsuitable habitat
Esacus neglectus Esacus magnirostris	Beach Stone-curlew	CE	—	Beaches, mudflats, reefs and especially islands (Blakers et al. 1984). Open undisturbed beaches, islands, reefs, intertidal sand and mudflats, preferably with estuaries or mangroves nearby (DECC 2007).	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Glossopsitta pusilla	Little Lorikeet	V	—	In New South Wales Little Lorikeets are distributed 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. Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. They feed primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands White Box *Eucalyptus albens* and Yellow Box *E. melliodora* are particularly important food sources for pollen and nectar respectively.	No. Unsuitable habitat
Hieraaetus morphnoides	Little Eagle	V	—	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living rees within a remnant patch, where pairs build a large stick nest in winter. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	No. Unsuitable habitat
Ixobrychus flavicollis	Black Bittern	V	—	Occurs in both terrestrial and estuarine wetlands generally in areas of permanent water and dense vegetation (DECC 2007). In areas with permanent water it may occur in flooded grassland, forest, woodland, rainforest and mangroves (DECC 2007)	No. Unsuitable habitat
Lathamus discolor	Swift Parrot	E	E	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts (Blakers et al. 1984; Schodde and Tidemann 1986; Forshaw and Cooper 1981). Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (Eucalyptus robusta), Spotted Gum (Corymbia maculata), Red Bloodwood (C. gummifera), Mugga Ironbark (E. sideroxylon), and White Box (E. albens) (DECC 2007).	No. Unsuitable habitat
Lophoictinia isura	Square-tailed Kite	V	—	In coastal areas associated tropical and temperate forests and woodlands on fertile soils with an abundance of passerine birds (Marchant & Higgins 1993, DECC 2007). May be recorded inland along timbered watercourses (DECC 2007). In NSW it is commonly associated with ridge or gully forests dominated by Woollybutt (Eucalyptus logifloria), Spotted Gum (E. maculata), or Peppermint Gum (E. elata, E. smithii) (DECC 2007).	No. Unsuitable habitat
Neophema chrysogaster	Orange-bellied Parrot	E	E, M	Breeds only in coastal south-west Tasmania and spends the winter in coastal Victoria and South Australia. It nests in hollows in eucalypt trees which grow adjacent to its feeding plains. In early October the birds arrive in the south west and depart after the breeding season usually in March and April. It feeds on the seeds of several sedges and heath plants, including buttongrass. Its main food preferences are found in sedgelands which have not been burned for between 3-15 years. Also included in the diet are seeds of three Boronia species and the everlasting daisy *Helichrysum pumilum*. After breeding, migrating birds move gradually northwards up the west coast, through the Hunter Group and King Island in Bass Strait and on to the mainland. On the journey the birds usually feed on beach-front vegetation including salt tolerant species such as sea rocket *Cakile maritima*. They also eat various coastal native and introduced grasses.	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Neophema pulchella	Turquoise Parrot	V	—	Steep rocky ridges and gullies, rolling hills, valleys and river flats and the plains of the Great Dividing Range compromise the topography inhabited by this species (Marchant & Higgins 1993). Spends much of the time on the ground foraging on seed and grasses (DECC 2007). It is associated with coastal scrubland, open forest and timbered grassland, especially low shrub ecotones between dry hardwood forests and grasslands with high proportion of native grasses and forbs (Environment Australia 2000).	No. Unsuitable habitat
Oxyura australis	Blue-billed Duck	V	—	The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation (DECC 2007). The species is completely aquatic, swimming low in the water along the edge of dense cover (DECC 2007). It will fly if disturbed, but prefers to dive if approached (DECC 2007). Blue-billed Ducks are partly migratory, with short-distance movements between breeding swamps and over-wintering lakes with some long-distance dispersal to breed during spring and early summer (DECC 2007). Young birds disperse in April-May from their breeding swamps in inland NSW to non-breeding areas on the Murray River system and coastal lakes (DECC 2007).	No. Unsuitable habitat
Pachycephala olivacea	Olive Whistler	V		Elevated (>500 MASL), cool temperate rainforest and moist eucalypt forest in the northern part of their range. This species appears to favour large tracts of undisturbed and densely vegetated forest (SFNSW 1995).	No. Unsuitable habitat
Pandion cristatus	Eastern Osprey	V	—	Associated with waterbodies including coastal waters, inlets, lakes, estuaries, beaches, offshore islands and sometimes along inland rivers (Schodde and Tidemann 1986; Clancy 1991; Olsen 1995). Osprey may nest on the ground, on sea cliffs or in trees (Olsen 1995). Osprey generally prefer emergent trees, often dead or partly dead with a broken off crown (Olsen 1995).	No. Unsuitable habitat
Petroica boodang	Scarlet Robin	V	-	The Scarlet Robin is primarily a resident in dry forests and woodlands, but some adults and young birds disperse to more open habitats after breeding	No. Unsuitable habitat
Petroica phoenicea	Flame Robin	V		Unlikely. Site only close to rainforest edge and highly disturbed	No. Unsuitable habitat
Petroica rodinogaster	Pink Robin	V	—	The Pink Robin is found in Tasmania and the uplands of eastern Victoria and far south-eastern NSW, almost as far north as Bombala. On the mainland, the species disperses north and west and into more open habitats in winter, regularly as far north as the ACT area, and sometimes being found as far north as the central coast of NSW. Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies. Breeds between October and January and can produce two clutches in a season.	
Pezoporus wallicus wallicus	Ground Parrot (eastern subspecies)	V	—	Predominantly restricted to coastal heath and sedgelands that provide a high density of cover and food foraging resources (Blakers et al. 1984; Simpson & Day 1999).	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Ptilinopus regina	Rose-crowned Fruit-Dove	V	—	Tall tropical and subtropical, evergreen or semi-deciduous rainforests, especially with a dense growth of vines trees (Marchant and Higgins 1999). Also located in closed wet sclerophyll forest, gallery forests or sclerophyll woodlands with abundant fruiting trees, near or next to rainforest (DECC 2007). Is thought to prefer large areas of vegetation, but has been located in patches and occasionally in parks and gardens with fruiting trees (Marchant and Higgins 1999).	Unlikely. Site only close to rainforest edge and highly disturbed
Ptilinopus superbus	Superb Fruit-Dove	V	—	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms (DECC 2007). It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees (*ibid.*). Part of the population is migratory or nomadic (*ibid.*). At least some of the population, particularly young birds, moves south through Sydney, especially in autumn (*ibid.*). Breeding takes place from September to January (*ibid.*). Will feed in adjacent mangroves or eucalypt forests (Blakers et al. 1984).	Unlikely. Site only close to rainforest edge and highly disturbed
Stagonopleura guttata	Diamond Firetail	V	—	Typically found in grassy eucalypt woodlands, but also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities (DECC 2007). It is often found in riparian areas and sometimes in lightly wooded farmland (DECC 2007). Appears to be sedentary, though some populations move locally, especially those in the south (DECC 2007).	No. Unsuitable habitat
Stictonetta naevosa	Freckled Duck	V	—	Associated with a variety of plankton-rich wetlands, such as heavily vegetated, large open lakes and their shores, creeks, farm dams, sewerage ponds and floodwaters (DECC 2007).	No. Unsuitable habitat
Xanthomyza phrygia *Anthochaera phrygia*	Regent Honeyeater	CE	E, M	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (Casuarina cunninghamiana) (Garnett 1993). Areas containing Swamp Mahogany (Eucalyptus robusta) in coastal areas have been observed to be utilised (NPWS 1997). The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (NPWS 1995). As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar (Environment Australia 2000).	No. Unsuitable habitat
NOCTURNAL BIRDS					
Ninox connivens	Barking Owl	V	—	Associated with a variety of habitats such as savanna woodland, open eucalypt forests, wetland and riverine forest. The habitat is typically dominated by Eucalypts (often Redgum species), however often dominated by Melaleuca species in the tropics (DECC 2007). It usually roosts in dense foliage in large trees such as River She-oak (Allocasuarina cunninghamiana), other Casuarina and Allocasuarina, eucalypts, Angophora, Acacia and rainforest species from streamside gallery forests (NPWS 2003). It usually nests near watercourses or wetlands (NPWS 2003) in large tree hollows with entrances averaging 2-29 metres above ground, depending on the forest or woodland structure and the canopy height (Debus 1997).	No. Unsuitable habitat
Ninox strenua	Powerful Owl	V	—	Powerful Owls are associated with a wide range of wet and dry forest types with a high density of prey, such as arboreal mammals, large birds and flying foxes (Environment Australia 2000, Debus & Chafer 1994). Large trees with hollows at least 0.5m deep are required for shelter and breeding (Environment Australia 2000).	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Tyto novaehollandiae	Masked Owl	V	—	Associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland (DECC 2007) and especially the ecotone between wet and dry forest, and non forest habitat (Environment Australia 2000). Known to utilise forest margins and isolated stands of trees within agricultural land (Hyem 1979) and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained (Kavanagh & Peake 1993).	No. Unsuitable habitat
Tyto tenebricosa	Sooty Owl	V	—	Sooty Owls are associated with tall wet old growth forest on fertile soil with a dense understorey and emergent tall Eucalyptus species (Environment Australia 2000, Debus 1994). Pairs roost in the daytime amongst dense vegetation, in tree hollows and sometimes in caves. The Sooty Owl is typically associated with an abundant and diverse supply of prey items and a selection of large tree hollows (Debus 1994, Garnett 1993, Hyem 1979).	No. Unsuitable habitat
MAMMALS (EXCLUDING BATS)					
Cercartetus nanus	Eastern Pygmy-possum	V	—	Found in wet and dry eucalypt forest, subalpine woodland, coastal banksia woodland and wet heath (Menkhorst & Knight 2004). Pygmy-Possums feed mostly on the pollen and nectar from banksias, eucalypts and understorey plants and will also eat insects, seeds and fruit (Turner & Ward 1995). The presence of Banksia sp. and Leptospermum sp. are an important habitat feature (DECC 2007). Small tree hollows are favoured as day nesting sites, but nests have also been found under bark, in old birds nests and in the branch forks of tea-trees (Turner & Ward 1995).	No. Unsuitable habitat
Dasyurus maculatus *Dasyurus maculatus maculatus*	Spotted-tailed Quoll Spotted-tailed Quoll (SE Mainland Population)	V —	— E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECC 2007j), more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000).	No. Unsuitable habitat
Isoodon obesulus	Southern Brown Bandicoot	E	E	This species is associated with heath, coastal scrub, heathy forests (Menkhorst & Knight 2004), shrubland and woodland on well drained soils. This species is thought to display a preference for newly regenerating heathland and other areas prone to fire (Menkhorst & Seebeck 1990). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils.	No. Unsuitable habitat
Petaurus australis	Yellow-bellied Glider	V	—	This species is restricted to tall mature forests, preferring productive tall open sclerophyll forests with a mosaic of tree species including some that flower in winter (Environment Australia 2000, Braithwaite 1984, Davey 1984, Kavanagh 1984; DECC 2007). Large hollows within mature trees are required for shelter, nesting and breeding (Henry and Craig 1984; DECC 2007).	No. Unsuitable habitat
Petaurus norfolcensis	Squirrel Glider	V	—	Associated with dry hardwood forest and woodlands (Menkhorst et al. 1988; Quin 1995). Habitats typically include gum barked and high nectar producing species, including winter flower species (Menkhorst et al. 1988). The presence of hollow bearing eucalypts is a critical habitat value (Quin 1995).	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices (Strahan 1995).	No. Unsuitable habitat
Phascolarctos cinereus	Koala	V	—	Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed et al. 1990), with acceptable Eucalypt food trees. Some preferred Eucalyptus species are: Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis	No. Unsuitable habitat
Potorous tridactylus *Potorous tridactylus tridactylus*	Long-nosed Potoroo Long-nosed Potoroo (SE Mainland Population)	V —	— V	Associated with dry coastal heath and dry and wet sclerophyll forests (Strahan 1998) with dense cover for shelter and adjacent more open areas for foraging (Menkhorst & Knight 2004).	No. Unsuitable habitat
Pseudomys novaehollandiae	New Holland Mouse	-	V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, NSW and Queensland. In NSW, the New Holland Mouse is known from: Royal National Park (NP) and the Kangaroo Valley (Posamentier & Recher 1974); Kuringai Chase NP (Prosser et al. 2007); and Port Stephens to Evans Head near the Queensland border (Prosser et al. 2007). The New Holland Mouse has been found from coastal areas and up to 100 km inland on sandstone country (Wilson & Laidlaw 2003). The species has been recorded from sea level up to around 900 m above sea level (Menkhorst et al. 2008). Soil type may be an important indicator of suitability of habitat for the New Holland Mouse, with deeper top soils and softer substrates being preferred for digging burrows. Habitats include open heathland and open woodland with a heathland understorey and vegetated sand dunes	No. Unsuitable habitat
Sminthopsis leucopus	White-footed Dunnart	V	—	The White-footed Dunnart occurs in Tasmania and along the Victorian and southern NSW coast. The Shoalhaven area is the species' northern-most limit. The White-footed Dunnart is found in a range of different habitats across its distribution, including coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest. In NSW, the species seems to favour vegetation communities with an open understorey structure. Mating occurs in late July and August. Breeding populations have been recorded in logged forest shortly after disturbance, but these usually do not persist as regeneration proceeds and a dense ground cover of vegetation establishes. The White-footed Dunnart is an opportunistic carnivore that feeds on a variety of ground-dwelling invertebrates and, occasionally, small lizards. They shelter in bark nests in hollows under standing or fallen timber, burrows in the ground, piles of logging debris, large grass clumps such as provided by Grass Trees *Xanthorrhoea sp.* and Macrozamias and rock crevices.	No. Unsuitable habitat
MAMMALS (BATS)					

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests (Churchill 1998; DECC 2007). This species roosts in caves, rock overhangs and disused mine shafts and as such is usually associated with rock outcrops and cliff faces (Churchill 1998; DECC 2007).	No. Unsuitable habitat
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	—	Prefers moist habitats with trees taller than 20m (DECC 2007). Roosts in tree hollows but has also been found roosting in buildings or under loose bark (DECC 2007).	No. Unsuitable habitat
Kerivoula papuensis	Golden-tipped Bat	V	—	The most favoured habitat for this species is moist closed forests often with a rainforest influence, however, some captures have been made in dry forests some distance from any rainforest (Lunney et. al. 1986; Parnaby and Mills, 1994). It has been suggested that the amount of vines and complex tree layers allows for increased numbers of spiders and webs and such areas are sought by the Golden-tipped Bat (Schulz & Eyre 2000). This species is often caught over streams within rainforest are known to frequently roost within the pendulous nests of Yellow-throated and Large-billed Scrub Wrens and Brown Gerygone in such areas (Schulz & Eyre 2000).	No. Unsuitable habitat
Miniopterus australis	Little Bent-wing Bat	V	—	Prefers well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests (Churchill 1998). This species shelter in a range of structures including culverts, drains, mines and caves (Environment Australia 2000). Relatively large areas of dense vegetation of either wet sclerophyll forest, rainforest or dense coastal banksia scrub are usually found adjacent to caves in which this species is found (DECC 2007). Breeding occurs in caves, usually in association with M. schreibersii (Environment Australia 2000, DECC 2007).	Unlikely. Majority unsuitable habitat and rainforest margin adjacent to site highly disturbed
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	V	—	Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1995, Dwyer 1981). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).	Unlikely. Majority unsuitable habitat and rainforest margin adjacent to site highly disturbed
Mormopterus norfolkensis	East Coast Freetail Bat	V	—	Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range (Churchill 1998). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges (Environment Australia 2000; Allison & Hoye 1998). Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (Environment Australia 2000; Allison & Hoye 1998).	Potential. Some suitable foraging habitat and hollows nearby off site
Myotis macropus	Southern Myotis	V	—	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	No. Unsuitable habitat

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Pteropus poliocephalus	Grey-headed Flying-Fox	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).	Potential. Some suitable forage trees
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	—	Found in almost all habitats, from wet and dry sclerophyll forest, open woodland (Churchill 1998), open country, mallee, rainforests, heathland and waterbodies (SFNSW 1995). Roosts in tree hollows; may also use caves; has also been recorded in a tree hollow in a paddock (Environment Australia 2000) and in abandoned sugar glider nests (Churchill 1998). The Yellow-bellied Sheathtail-bat is dependent on suitable hollow-bearing trees to provide roost sites, which may be a limiting factor on populations in cleared or fragmented habitats (Environment Australia 2000).	Potential. Some suitable foraging habitat and hollows nearby off site
Scoteanax rueppellii	Greater Broad-nosed Bat	V	—	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill, 1998), tending to be more frequently located in more productive forests (Hoye & Richards 1998). Within denser vegetation types use is made of natural and man made openings such as roads, creeks and small rivers, where it hawks backwards and forwards for prey (Hoye & Richards 1998).	Unlikely. Site only close to rainforest edge and highly disturbed
MIGRATORY TERRESTRIAL SPECIES LISTED UNDER EPBC ACT					
Apus pacificus	Fork-tailed Swift	-	M	Sometimes travels with Needletails. Varied habitat with a possible tendency to more arid areas but also over coasts and urban areas (Simpson & Day 1999).	Unlikely. Overfly only
Haliaeetus leucogaster	White-bellied Sea-Eagle	—	M	Forages over large open fresh or saline waterbodies, coastal seas and open terrestrial areas (Marchant & Higgins 1993, Simpson & Day 1999). Breeding habitat consists of tall trees, mangroves, cliffs, rocky outcrops, silts, caves and crevices and is located along the coast or major rivers. Breeding habitat is usually in or close to water, but may occur up to a kilometre away (Marchant & Higgins 1993).	Unlikely. Overfly only
Hirundapus caudacutus	White-throated Needletail	—	M	Forages aerially over a variety of habitats usually over coastal and mountain areas, most likely with a preference for wooded areas (Marchant & Higgins 1993; Simpson & Day 1999). Has been observed roosting in dense foliage of canopy trees, and may seek refuge in tree hollows in inclement weather (Marchant & Higgins 1993).	Unlikely. Overfly only
Merops ornatus	Rainbow Bee-eater	—	M	Resident in coastal and subcoastal northern Australia; regular breeding migrant in southern Australia, arriving September to October, departing February to March, some occasionally present April to May (Pizzey and Doyle 1988). Occurs in open country, chiefly at suitable breeding places in areas of sandy or loamy soil: sand-ridges, riverbanks, road-cuttings, sand-pits, occasionally coastal cliffs (*ibid*). Nest is a chamber a the end of a burrow, up to 1.6 m long, tunnelled in flat or sloping ground, sandy back or cutting (*ibid*).	No. Unsuitable habitat
Monarcha melanopsis	Black-faced Monarch	—	M	Rainforest and eucalypt forests, feeding in tangled understorey (Blakers et al. 1984).	Unlikely. Site only close to rainforest edge and highly disturbed

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Myiagra cyanoleuca	Satin Flycatcher	—	M	Associated with drier eucalypt forests, absent from rainforests (Blakers et al. 1984), open forests, often at height (Simpson & Day 1999).	No. Unsuitable habitat
Neophema chrysogaster	Orange-bellied Parrot	E	E, M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE
Rhipidura rufifrons	Rufous Fantail	—	M	The Rufous Fantail is a summer breeding migrant to southeastern Australia (Morcombe, 2004). The Rufous Fantail is found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation (Morcombe, 2004). Open country may be used by the Rufous Fantail during migration (Morcombe, 2004).	No. Unsuitable habitat
Xanthomyza phrygia *Anthochaera phrygia*	Regent Honeyeater	CE	E, M	SEE DIURNAL BIRDS ABOVE	SEE DIURNAL BIRDS ABOVE
MIGRATORY WETLAND SPECIES LISTED UNDER EPBC ACT					
Ardea ibis	Cattle Egret	—	M	Cattle Egrets forage on pasture, marsh, grassy road verges, rain puddles and croplands, but not usually in the open water of streams or lakes and they avoid marine environments (McKilligan, 2005). Some individuals stay close to the natal heronry from one nesting season to the next, but the majority leave the district in autumn and return the next spring. Cattle Egrets are likely to spend the winter dispersed along the coastal plain and only a small number have been recovered west of the Great Dividing Range (McKilligan, 2005).	No. Unsuitable habitat
Gallinago hardwickii	Latham's Snipe	—	M	A variety of permanent and ephemeral wetlands, preferring open fresh water wetlands with nearby cover (Marchant and Higgins 1999). Occupies a variety of vegetation around wetlands (Marchant and Higgins 1999) including wetland grasses and open wooded swamps (Simpson and Day 1999).	No. Unsuitable habitat
Rostratula benghalensis s. lat.	Painted Snipe	—	M	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber (DECC 2007). Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds (*ibid.*). Breeding is often in response to local conditions; generally occurs from September to December (DECC 2007). Roosts during the day in dense vegetation (NSW Scientific Committee 2004). Forages nocturnally on mud-flats and in shallow water (DECC 2007). Feeds on worms, molluscs, insects and some plant-matter (*ibid.*).	No. Unsuitable habitat

Disclaimer: Data extracted from the Atlas of NSW Wildlife and DEW Protected Matters Report are only indicative and cannot be considered a comprehensive inventory. 'Migratory marine species' and 'listed marine species' listed on the EPBC Act (and listed on the DEW protected matters report) have not been included in this table, since they are considered unlikely to occur within the study area due to the absence of marine habitat.

Appendix 2 – TSC Act and EPBC Act significance assessments

Assessment of Significance (TSC Act 7 part test)

The EP&A Act includes in Section 5A, seven factors which are to be considered when determining if a proposed development or activity '*is likely to have a significant effect on the threatened species, populations or ecological communities, or their habitats'.* These seven factors must be taken into account by consent or determining authorities when considering a development proposal or development application. This enables a decision to be made as to whether there is likely to be a significant effect on the species and hence if a Species Impact Statement is required (DECC 2007).

Based on the field surveys and likelihood of occurrence table, three species were known to or have the potential to occur within the study area. These were the:

- East Coast Freetail Bat
- Grey-headed Flying-Fox
- Yellow-bellied Sheathtail-bat

These entities are assessed below.

(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,

Grey-headed Flying-fox

The Grey-headed Flying-fox is the largest Australian bat found within 200km of the east coast of Australia. They occur in rainforest, forests and woodlands, heaths and swamps as well as urban areas (DECCW 2010c). Roosting camps are generally located within 20km of a regular food source and are commonly found in gullies. Fidelity to roost sites is high and impacts to this species largely come about direct impacts to roost camps through disturbance (DECCW 2010c).

Grey-headed Flying-foxes were predicted to occur from time to time on the site, particularly due to the large *Ficus macrophylla* on site and the *Melaleuca quinquenervia* which are favoured flowering resources. This species travels significant distances for feeding resources and the site does not contain any roost sites.

The proposed action would rezone a small sliver of land within the lot from RU2 Rural Landscape to R2 Low Density Residential to rationalise the zoning and make the sliver consistent with the rest of the majority of the lot.

This change in zoning of the sliver of land will not have a significant effect on the permissible uses for the overall lot as the majority of the land is already zoned R2. A significant proportion of the RU2 zoned sliver of land proposed for rezoning already incorporates part of the existing

dwelling. The environmental values on the site are not inconsistent with the proposed new zoning of R2. The change in zoning of the small sliver of Lot 20 DP1151501 will not alter future impacts to threatened species or communities due to any potential change of landuse.

Grey-headed Flying-foxes are regarded as highly mobile and the foraging resources within the study area are present throughout the immediate and wider locality. As the change in zoning of the small sliver of the lot will not alter future impacts to environmental values due to any potential change of landuse, habitat potentially important to the life cycle of any local population of these species will be retained.

Considering these factors, the proposed activity is unlikely to have an adverse effect on the life cycle of these species, such that a viable local population is likely to be placed at risk of extinction.

Microbats (Eastern Freetail-bat, Yellow-bellied Sheathtail Bat)

The Eastern Freetail-bat and Yellow-bellied Sheathtail Bat, are forest dependant microbat species (Churchill 2008; DECCW 2010c). Habitat essential to the lifecycle of these species includes forest (foraging habitat) that contains HBT (roost and breeding sites).

Both of these microbat species were predicted to occur on the site as they both utilise a wide variety of areas for foraging, including disturbed forest types and some cleared areas. There were no HBTs recorded so the site represents foraging potential only.

The proposed action would rezone a small sliver of land within the lot from RU2 Rural Landscape to R2 Low Density Residential to rationalise the zoning and make the sliver consistent with the rest of the majority of the lot.

This change in zoning of the sliver of land will not have a significant effect on the permissible uses for the overall lot as the majority of the land is already zoned R2. A significant proportion of the RU2 zoned sliver of land proposed for rezoning already incorporates part of the existing dwelling. The environmental values on the site are not inconsistent with the proposed new zoning of R2. The change in zoning of the small sliver of Lot 20 DP1151501 will not alter future impacts to threatened species or communities due to any potential change of landuse.

Microbats are regarded as highly mobile and the foraging resources within the study area are present throughout the immediate and wider locality. As the change in zoning of the small sliver of the lot will not alter future impacts to environmental values due to any potential change of landuse, habitat potentially important to the life cycle of any local population of these species will be retained.

Considering these factors, the proposed activity is unlikely to have an adverse effect on the life cycle of these species, such that a viable local population is likely to be placed at risk of extinction.

(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,

No endangered populations are known within the area.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

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,

No endangered or critically endangered ecological communities were present on the site.

(d) in relation to the habitat of a threatened species, population or ecological community:

the extent to which habitat is likely to be removed or modified as a result of the action proposed

The proposed action will rezone a small sliver of land in line with the rest of the zoning on the majority of the lot. Potential changes in landuses on the site as a result will not significantly alter any important habitat on the site.

whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action

The proposed action will not isolate or fragment other areas of habitat.

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

Potential changes in landuses on the site as a result of the rezoning will not significantly alter any important habitat on the site.

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

There is no critical habitat as listed by the TSC Act found within the Kiama LGA of relevance on this site.

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

At the time of writing, a number of recovery plans were available for entities that are the subject of this assessment. These plans are listed and considered below.

A draft National Recovery Plan for the Grey-headed Flying-fox has been prepared (DECCW 2009) and a number of specific objectives have been listed as part of the recovery of the species. These objectives include:

- To identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes throughout their range
- To protect and increase the extent of key winter and spring foraging habitat of Grey-headed Flying-foxes
- To identify roosting habitat critical to the survival of Grey-headed Flying-foxes
- To protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes
- To substantially reduce deliberate destruction of Grey-headed Flying-foxes in fruit crops
- To reduce negative public attitudes toward Grey-headed Flying-foxes and reduce conflict with humans
- To increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and to involve the community in recovery actions, where appropriate, to reduce the threat of negative public attitudes and conflict with humans
- To monitor population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and status
- To assess and reduce the impact on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and on barbed-wire
- To improve knowledge of the demographics and population structure of Greyheaded Flying-foxes in order to increase understanding of the ecological requirements of the species
- To increase the effectiveness and efficiency of recovery initiatives for Greyheaded Flying-foxes by working cooperatively with conservation and management programs with overlapping objectives to remove or reduce the impact of threatening processes on the species
- To maintain an effective Grey-headed Flying-fox National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan to remove or reduce the impact of threatening processes on the species.
- To provide long-term economic benefits associated with the protection of ecosystem services, promotion of sustainable forest management, improved crop protection regimes, promotion of sustainable agricultural practices and increased viability of some commercial fruit industries.

The development is considered to be consistent with the above objectives.

(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.

The rezoning action on the site does not constitute a key threatening process. There is some potential for the rezoning to establish a pathway for future development and the *clearing of native vegetation*, a listed KTP. However, these impacts need to be assessed at such a time and

are unlikely to be considered significant due to the highly disturbed and fragmented nature of the vegetation on the site.

Conclusion of 7 part test

This Assessment of Significance has determined that the proposed activity is *'unlikely'* to have a *'significant effect'* on the Eastern Freetail-bat, Grey-headed Flying-fox or Yellow-bellied Sheathtail Bat.

Therefore, the proposed activity will not require a Species Impact Statement.

EPBC Act significance assessment

The EPBC Act Administrative Guidelines on Significance set out **'Significant Impact Criteria'** that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World Heritage properties
- National Heritage places
- Nuclear actions

Specific **'Significant Impact Criteria'** are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act. Threatened and migratory species listed under the EPBC Act that are considered likely or potentially to occur within the study area are given in Appendix C of the Report. The relevant Significant Impact Criteria have been applied to these threatened and migratory species to determine the significance of impact of the project.

Matters to be addressed	**IMPACT (COMMONWEALTH LEGISLATION)**
a. any environmental impact on a World Heritage Property;	No
b. any environmental impact on Wetlands of International Importance;	The proposal will not affect any part of RAMSAR wetland.
c. any impact on Commonwealth Listed Critically Endangered or Endangered Species;	No Commonwealth listed endangered species occur within the subject Lot (*Cynanchum elegans* and *Zieria granulata* were found along the nearby creekline and would need to be assessed under any future development applications where potential impacts on that area may be likely). The significant impact criteria in terms of endangered species are discussed below: *a. lead to a long-term decrease in the size of a population* *b. reduce the area of occupancy of the species* *c. fragment an existing population into two or more populations* *d. adversely affect habitat critical to the survival of a species* *e. disrupt the breeding cycle of a population*

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	f. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline *g. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat* *h. introduce disease that may cause the species to decline; or* *i. interfere with the recovery of the species.*
d. any impact on Commonwealth Listed Vulnerable Species;	One Commonwealth listed vulnerable species are considered potential or likely to occur in the study area: • Grey-headed Flying-fox The significant impact criteria in terms of the vulnerable species are discussed below: *a. lead to a long-term decrease in the size of an important population of a species,* The habitat on the site does not represent an area critical for the long-term survival of the Grey-headed Flying-fox. The rezoning of a small sliver of the lot in line with the majority of the site is not considered to lead to a long-term decrease in any population size in the area. *b. reduce the area of occupancy of an important population* Only a small area of foraging habitat is present on the site and it does not support any part of an important population. The proposal will not reduce the area of occupancy for an important population of this species. *c. fragment an existing important population into two or more populations* The proposed clearing will not further increase the fragmentation of any populations. *d. adversely affect habitat critical to the survival of a species* No habitat on site is considered to be critical to the survival of the species. *e. disrupt the breeding cycle of an important population* The site does not contain breeding habitat for the Grey-headed Flying-fox. As the site is not considered to contain any important populations, this proposal will not cause any disruption to the breeding cycle of an important population. *f. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline* The action will not isolate or fragment any valuable habitat on the site due to the highly disturbed condition of the vegetation. *g. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat* The proposal will not increase the risk from invasive species. *h. introduce disease that may cause the species to decline* The proposal will not lead to the introduction of a disease that may cause these species to decline at the site. *i. interferes substantially with the recovery of the species.* As the proposal is not considered to decrease or fragment existing populations, the recovery of the species will not be substantially impacted
e. any environmental	No. The site is not likely to provide habitat for any listed migratory species.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
impact on Commonwealth Listed Migratory Species;	
f. does any part of the Proposal involve a Nuclear Action;	No. The project does not include a Nuclear Action.
g. any environmental impact on a Commonwealth Marine Area;	No. There are no Commonwealth Marine Areas within the study area.
h. In addition, any direct or indirect impact on Commonwealth lands	No. The project does not directly or indirectly affect Commonwealth land.

Conclusion of EPBC Act assessment

It is unlikely that the development will significantly impact on these threatened species. The site provides only a small amount of foraging habitat for the fauna assessed species (Grey-headed Flying-fox) and the level of future potential habitat removal will be negligible in the context of the condition of the habitat and available habitat in the locality.

Therefore, referral to the Commonwealth under the EPBC Act is not recommended.