



Ecological Impact Assessment



Anglican Care

Proposed Residential Aged Care Facility
and Independent Living Units

1 – 25 Clement Street, Gloucester NSW

18 May 2018

Ecological Impact Assessment

Proposed Residential Aged Care Facility and Independent Living Units

1 – 25 Clement Street, Gloucester NSW

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Project No: 20190322

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Prepared for:

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1. INTRODUCTION

1.1 SCOPE

Kleinfelder was commissioned by APP Corporation, on behalf of Anglican Care, to prepare an Ecological Impact Assessment at 1 – 25 Clements Road (Lot 40 DP 1227815), Gloucester, NSW (**Figure 1**). The following terms are used throughout this report to describe particular geographical areas:

- Study Area - 1 – 25 Clements Road (Lot 40 DP 1227815), Gloucester, NSW (**Figure 2**).
- Impact Area – area subject to direct impacts, i.e. area in which the residential aged care facility and independent living units are proposed to be constructed; and
- Locality – land within a 5 kilometre radius of the study area.

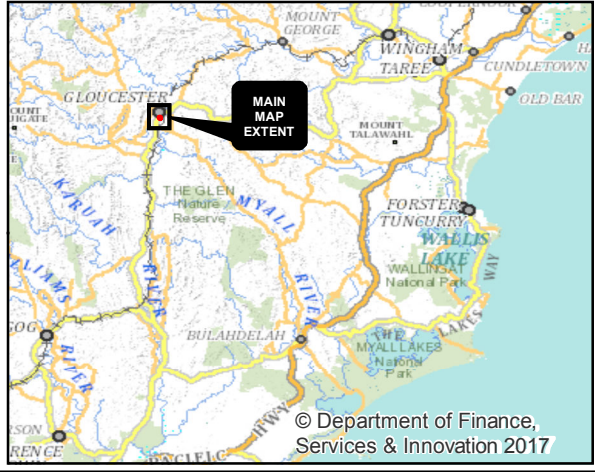
This report identifies flora, fauna and threatened species present, or likely to occur within the study area based on species and/or habitats detected during field surveys and threatened flora and fauna records from the locality. An assessment of the likely impacts on identified threatened species, habitat features, wildlife corridors and vegetation communities as a result of the development proposal is also undertaken.

1.2 LOCAL CONTEXT

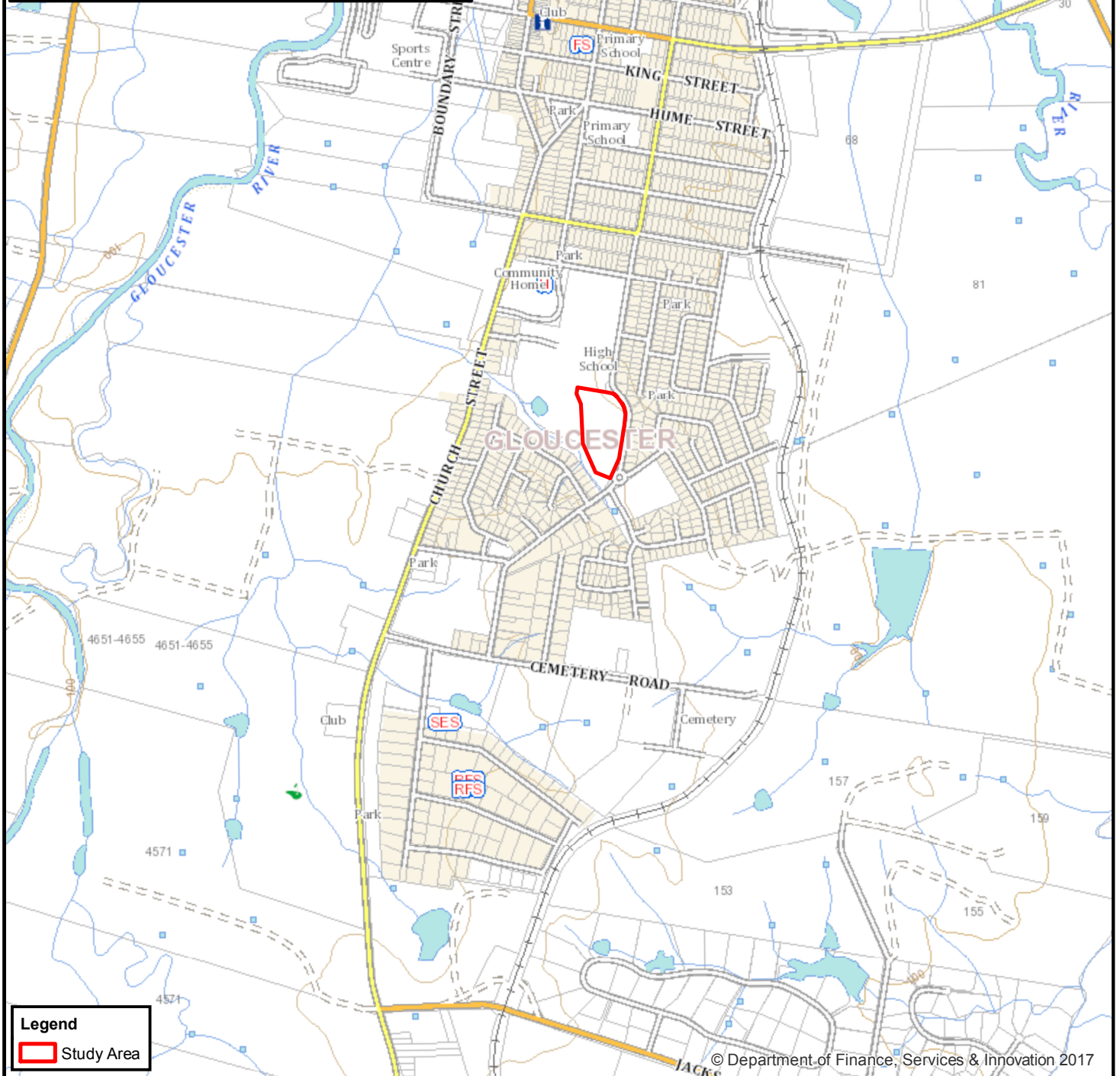
The study area is 2.99 ha and occurs in Lot 40 DP 1227815. It is bound by Clements Rd to the east and south, Gloucester High School to the north and private property to the west. The majority of the Lot is cleared of native vegetation, with isolated stands of remnant and exotic paddock trees. The predominant surrounding land uses are currently R2 – Low-density Residential, with small areas of RE1 – Public Recreation and SP2 – Infrastructure. The study area itself is zoned R2, with a small portion along the southern boundary zoned RE1. The study area adjoins land that is currently cleared for agricultural use, and Gloucester High School to the north. The study area falls within the Mid-Coast Council Local Government Area (LGA), formerly Gloucester LGA.

Regional Context

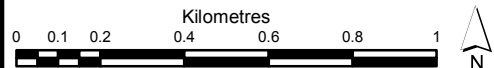
0 5 10 20 30 40 50 km



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Legend
 Study Area



PROJECT REFERENCE: 20190322
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 DRAWN BY: gjoyce
 DATA SOURCE: DFSI - 2017

Locality

Anglican Care
 Ecological Impact Assessment
 Proposed Residential Aged Care Facility
 and Independent Living Units
 1 – 25 Clement Street, Gloucester NSW

FIGURE:
1



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Legend

- Study Area
- Impact Area (Indicative)
- Lot Boundaries
- Local Road
- Watercourses

Metres
0 5 10 20 30 40 50

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Study Area and Impact Area

Anglican Care
Ecological Impact Assessment
Proposed Residential Aged Care Facility
and Independent Living Units
1 – 25 Clement Street, Gloucester NSW

FIGURE:
2

1.3 PROPOSED DEVELOPMENT

It is proposed to construct an aged care facility within the study area as a two-staged development. This facility would consist of a 44 bed residential aged care facility (RACF) and 30 independent living units (ILU). Other infrastructure would be required including internal roads, a community centre, a main driveway and associated gardens and landscaping.

1.4 LEGISLATION

This project was undertaken in accordance with and/or in consideration of the following Acts and Policies:

- Commonwealth:
 - *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- State:
 - *Biodiversity Conservation Act 2016 (NSW) (BC Act)*;
 - *Biodiversity Conservation Regulation 2017*
 - *National Parks and Wildlife Act 1974* (NP&W Act);
 - *Environmental Planning and Assessment Act 1979* (EP&A Act);
 - *Biosecurity Act 2015*;
 - *Water Management Act 2000* (WM Act);
 - *State Environmental Planning Policy 44 - Koala Habitat Protection* (SEPP 44).
- Local:
 - *Gloucester Shire Council Draft Development Control Plan 2010* (Gloucester Draft DCP 2010);
 - *Gloucester Local Environmental Plan 2010* (Gloucester LEP 2010); and

1.4.1 Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act assessment an approval is required for actions that are likely to have a significant impact on matters of national environmental significance. An action includes a project, development, undertaking, activity, or series of activities. When a person proposes to take an action they believe may need approval under the EPBC Act, they must refer the proposal to the Australian Government Minister for the Environment. The Act identifies nine matters of national environmental significance:

1. World Heritage properties;
2. National heritage places;

3. Wetlands of international importance (Ramsar Convention);
4. Listed threatened species and communities;
5. Migratory species listed under international agreements;
6. Great Barrier Reef Marine Park;
7. Commonwealth marine areas;
8. Nuclear actions; and
9. Water resources in respect to CSG and large coal mines.

Points 4 and 5 are relevant to the proposal and are assessed in **Section 4.1.3.3**.

1.4.2 Biodiversity Conservation Act 2016 (BC Act)

The *Biodiversity Conservation Act 2016* commenced on 25 August 2017. The BC Act repeals the *Threatened Species Conservation Act 1995* (TSC Act) as well as animal and plant provisions of the *National Parks and Wildlife Act 1974*.

Schedules 1 and 2 of the BC Act contain lists of flora and fauna species and communities, which have been determined by the NSW Scientific Committee as being under threat of serious decline that could ultimately lead to extinction. The BC Act provides for a five-part test of significance and impact to be applied to any of these listed species or communities that are found in an area subject to proposed development. Schedule 4 of the BC Act contains a list of 'key threatening processes' that are deemed to have a negative impact on threatened species, populations or communities.

1.4.2.1 Biodiversity Offset Scheme

The Biodiversity Offset Scheme (BOS) has also been introduced under this Act. Where certain thresholds are triggered by a development, offsets are subsequently required. The triggers for the BOS are as follows:

- Clearing thresholds (area and land on the Biodiversity Values Map) – Part 7 of the BC Regulation;
- Additional Biodiversity Values – Part 6.1 of the BC Regulation (vegetation integrity and habitat suitability); and
- 5-part test under section 7.3 of the BC Act.

Developments that trigger the BOS are assessed as per the Biodiversity Assessment Method. Developments that do not trigger the BOS require a Flora and Fauna Impact Assessment to

determine the likely impact of the development on biodiversity, as required under the EP&A Act.

The study area does not exceed the threshold for the Biodiversity Offsets Scheme (BOS). This has been determined under Part 7 of the *Biodiversity Conservation Regulation 2017*, in accordance with the area of native vegetation to be cleared and in conjunction with the minimum lot size of the land. As the study area is zoned R2, the minimum lot size for the land is 500 m². In accordance with Part 7, Section 7.2 of the Act, the area of clearing for this lot size that will trigger the BOS is 0.25 ha or more of native vegetation. It is proposed to clear 0.16 ha of native vegetation (see **Section 4**). Additionally, biodiversity values are considered to be low, considering the nature of the vegetation and habitat within the predominantly cleared site, and the Assessments of Significance concluded that the proposal would not have a significant impact on any locally occurring threatened species (see **Section 4.1.3.2**). Therefore, the proposed development does not trigger the BOS clearing threshold.

1.4.3 SEPP 44 – Koala Habitat Protection

SEPP 44 encourages the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.

Under SEPP 44, the identification of Potential Koala habitat and Core Koala habitat is outlined. Potential Koala habitat is defined as areas of native vegetation where the trees of the types outlined in **Table 1** constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

Table 1: List of SEPP 44 Schedule 2 preferred Koala feed trees

Common Name	Scientific Name
<i>Eucalyptus tereticornis</i>	Forest Redgum
<i>Eucalyptus microcorys</i>	Tallowwood
<i>Eucalyptus punctata</i>	Grey Gum
<i>Eucalyptus viminalis</i>	Ribbon or Manna Gum
<i>Eucalyptus camaldulensis</i>	River Redgum
<i>Eucalyptus haemastoma</i>	Broad-leaved Scribbly Gum
<i>Eucalyptus signata</i>	Scribbly Gum
<i>Eucalyptus albens</i>	White Box
<i>Eucalyptus populnea</i>	Bimble Box or Poplar Box
<i>Eucalyptus robusta</i>	Swamp Mahogany

2. METHODOLOGY

2.1 DATABASE SEARCHES

A list of threatened species and ecological communities that have been reported or modelled to occur from within a five kilometre radius of the study area was obtained from the following databases:

- NSW Office of Environment and Heritage (OEH) Atlas of NSW Wildlife: (<http://www.bionet.nsw.gov.au/>); and
- Department of Environment and Energy (DoTEE) Protected Matters search tool: (www.environment.gov.au/erin/ert/epbc/index.html).

2.1.1 Likelihood of Occurrence

An assessment was then made of the likelihood of the threatened species and / or ecological communities reported or modelled to occur in the locality occurring within the study area or using the habitat within the study area as an essential part of a foraging range. This assessment was based on available habitat requirement data for each threatened species and ecological communities using the following sources:

- Harden, G.J. (ed) (1992, 1993, 2000, 2002). Flora of New South Wales Volume 1-4. NSW University Press: Sydney;
- OEH threatened species website database:
- <http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx>;
- Van Dyke, S. and Strahan, R. (eds) (2008). The Complete Book of Australian Mammals. Reed New Holland Publishers, Australia;
- Cogger, H.A (ed) (2000). Reptiles and Amphibians of Australia. Reed New Holland Publishers, Australia; and
- Higgins, P. J. et al. (1990-2007). Handbook of Australian, New Zealand & Antarctic Birds. Volumes 1 to 7. Oxford University Press Publishers, Melbourne.

2.2 FIELD SURVEYS

Flora surveys were conducted by one ecologist on 3 May 2018 to compile information on the existing vegetation, flora species present and potential habitat for threatened flora and fauna species likely to be present within the study area (**Figure 3**).

Nocturnal fauna surveys were conducted by an ecologist on 3 and 10 May 2018, and a diurnal bird survey was conducted by an ecologist on 4 May 2018. The ecological assessment was conducted with regard to the Draft Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC, 2004).

2.2.1 Flora

2.2.1.1 Random Meanders

A total of 4 person hours were spent undertaking flora surveys over the study area. These searches were used to conduct targeted threatened species searches, conduct vegetation survey quadrats and compile a list of flora species on the site via random meander.

2.2.1.2 Floristic Quadrats

One standard 0.04 ha (20 m x 20 m) floristic quadrat was sampled for the presence of flora species (**Figure 3**), with approximate percent coverage and abundance of each species estimated by the observer. The quadrat was carefully examined to identify all plant species present. Searches continued until it was confident that all flora species within the quadrat were detected. Cover abundance of all flora species within the quadrat was recorded. See **Appendix 2** for flora results.

2.2.1.3 Floristic Identification and Nomenclature

Floristic identification and nomenclature was based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on PlantNet (The NSW Plant Information Network System). If a plant was unable to be identified using these references or a specimen was potentially rare or threatened, a sample was sent to the National Herbarium of New South Wales.

2.2.1.4 Vegetation Community Mapping

The identification of vegetation communities was based on dominant species present in the overstorey, midstorey, shrub and ground layers. The species association recorded in the study area were compared to Plant Community Types (PCT) published on the BioNet Vegetation Classification System the Office of Environment and Heritage (OEH 2017).

Due to the sparse area of native vegetation, the boundaries of each of the identified vegetation communities within the study area could be mapped using a combination of ground truthing and aerial photography interpretation (API).

2.2.2 Fauna

2.2.2.1 Bats

One AnaBat™ ultrasonic recorder (Titley Scientific, Lawnton QLD) was used to passively record the calls of any Microchiropteran bats occurring in the area. One unit was deployed in the centre of the study area for five nights (**Figure 3**). The unit was set to start at dusk and recording occurred overnight (5 pm to 6 am). Recorded calls were analysed using AnalookW™ and matched to reference calls published by Pennay *et al.* (2004).

2.2.2.2 Diurnal Birds

A diurnal bird survey was undertaken for thirty minutes across the study area on the morning of 4 May 2018, from 8:30 am. All birds that were seen or heard in the vicinity of the site were recorded.

2.2.2.3 Nocturnal Field Work

Spotlighting was undertaken from dusk on two nights (3 and 10 May 2018) targeting arboreal mammals and nocturnal birds. On the first night, two hollow-bearing trees (on the northern boundary of the site) were watched from thirty minutes prior to dusk, until one hour after dusk. On the second night, spotlighting was undertaken thirty minutes after sunset within the area containing the three hollow-bearing trees (on the eastern boundary of the site). All fauna was recorded where they were sighted or heard opportunistically.

2.2.2.4 Fauna Habitat

Habitat Assessments

Fauna habitat values observed during inspections of the study area were recorded. Attributes considered important to fauna include: hollow-bearing trees, nests, fallen timber/hollow logs, abundance of nectar and fruit resources, water bodies, vegetation cover and structural complexity, fallen timber and leaf litter. Suitability of habitat for threatened fauna species occurring in the locality was also assessed during the survey.

Habitat Tree Survey

A survey of trees within the development area was undertaken to locate hollow-bearing trees, dead standing stags and trees containing nests. The location of Habitat Trees and the type of feature it contained was recorded using a handheld GPS. For trees with hollows the number and size of hollows was recorded. Hollow size was classified as either small (< 8 cm diameter), medium (8 – 20 cm diameter) or large (> 20 cm diameter) based on the size of the hollow entrance.

2.3 SURVEY LIMITATIONS

Given the highly disturbed, fragmented and urban nature of the study area, the level of survey effort described in **Section 2.2** was considered suitable in regards to the likelihood of threatened fauna species being present at the site.

Within the study area, reptile habitat is extremely limited with no rocks or logs present, and loose bark on trees being minimal. Furthermore, no threatened reptile species are known from the locality (see **Appendix 1**). As such, no reptile searches were conducted.

Similarly, no habitat for threatened frog species is present. While there is a wet area in the study area, situated along a drainage line, this area is completely inundated with very tall exotic grasses and there is no standing water. As such, no targeted frog surveys were conducted, however any frogs observed or heard during the nocturnal work were recorded.

One diurnal bird survey was considered appropriate for the study area, given its urban and disturbed nature, with very little suitable foraging and breeding habitat available, particularly for threatened bird species.

No breeding habitat for threatened Owl species is present within the study area and marginal foraging habitat only would be removed. Similarly, due to the urban and fragmented nature of the hollow-bearing trees present on site, and the lack of midstorey, the habitat is not considered suitable for threatened arboreal mammals previously recorded in the locality. As such, no call playback was conducted for nocturnal birds or mammals.

The study area is likely to represent suitable habitat for threatened bat species only, which were surveyed for using the recommended methodology (see **Section 2.2.2**), however one Anabat device was considered adequate, given the relatively small size of the study area.

3. RESULTS

3.1 DATABASE REVIEW

Database searches conducted using the EPBC Protected Matters search tool and the OEH Atlas of NSW Wildlife returned a total of 48 threatened species that have previously been recorded, or are modelled to occur, within a 5 km radius of the study area. These include 10 plant, two amphibian, 11 bird and 16 mammal species. Additionally, nine migratory bird species listed under the EPBC Act were modelled to occur within a 5 km radius of the study area. Pelagic (ocean-dwelling) species, marine fish and shorebirds have been excluded from the assessment due to the lack of suitable habitat within the study area.

The full list of threatened species and ecological communities recorded in the database searches is provided in **Appendix 1**. The assessment of likelihood of occurrence of these threatened species and ecological communities within the study area is also provided in **Appendix 1**.

3.2 FIELD SURVEYS

3.2.1 Flora

A total of 51 flora species were recorded during field surveys (**Appendix 2**). None of the flora species detected are listed as threatened under the BC Act or EPBC Act.

Twenty-five of the flora species recorded within the study area are considered to be exotic or weed species. Three are listed as Weeds of National Significance (WONS); *Asparagus asparagoides* (Ground Asparagus), *Senecio madagascariensis* (Fireweed), and *Notelaea europaea* subsp. *cuspidata* (African Olive). Under the *Biosecurity Act 2015* all weeds have a general biosecurity duty.

3.2.2 Vegetation Communities

One degraded native vegetation community and one exotic community were identified within the study area. These communities are outlined below and mapped in **Figure 3**. Full descriptions of the communities within the study area are provided in **Appendix 4**.

Forest Redgum Grassy Open Forest on floodplains of the lower Hunter: A total of 0.24 ha of this community exists in the study area. It is dominated by *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Redgum) in the canopy. The midstorey is no longer present in this community, due to historical clearing, and the ground cover consists predominantly of exotic grasses such as *Chloris gayana* (Rhodes Grass) and *Sporobolus africanus* (Parramatta Grass).

The Forest Redgum Grassy Open Forest within the study area forms part of the *Hunter Lowland Redgum Forest of the Sydney Basin and NSW North Coast bioregions* EEC listed under the BC Act (outlined in **Appendix 4**).

Exotic Grassland: A total of 2.75 ha of this community exists within the study area. This community is dominated by exotic grass species *Chloris gayana*, *Sporobolus africanus*, *Axonopus fissifolius* (Narrow-leaved Carpet Grass) and *Ehrharta erecta*. Native grasses such as *Themeda triandra* (Kangaroo Grass) and *Cymbopogon refractus* (Barbed Wire Grass) occasionally occur. This community also contains isolated individual remnant *E. moluccana*, *E. crebra* and *E. tereticornis* trees and saplings.

3.2.3 Fauna

A total of 30 species of fauna were detected within the study area during field surveys. This included one amphibian, 18 bird and 11 mammal species. Four microchiropteran bat species listed as vulnerable under the BC Act were detected within the study area; *Miniopterus australis* (Little Bentwing-bat), *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat), *Mormopterus norfolkensis* (Eastern Free-tailed Bat) and *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat).

A Brushtail Possum (*Trichosurus vulpecula*) was observed emerging from a hollow in HBT2 (see **Figure 3**) while undertaking nocturnal spotlighting and stagwatching.

The full list of species detected within the study area are provided in **Appendix 3**.

3.2.4 Fauna Habitat

The native vegetation within the study area is considered to provide low to moderate fauna habitat. The terms low to moderate have been used because much of the study area has been previously cleared, over a largely disturbed, exotic ground cover. The study area does contain the following habitat features:

- Feed tree species for a range of fauna species: including *Eucalyptus tereticornis* (Forest Redgum), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Eucalyptus moluccana* (Grey Box) likely to be utilised as a source of nectar when flowering by local birds, Flying-foxes and insects.
- Six hollow-bearing trees which would provide roosting and breeding opportunities for local bird and mammal species.

Habitat Trees

Six hollow-bearing trees were identified within the study area, and contain a total of 11 small to medium hollows (see **Figure 3** and **Table 2**). Three dead stags also occur within the study area. These hollows may provide habitat for microchiropteran bats and various bird species, with two Rainbow Lorikeets (*Trichoglossus moluccanus*) seen emerging from a hollow in HBT1.

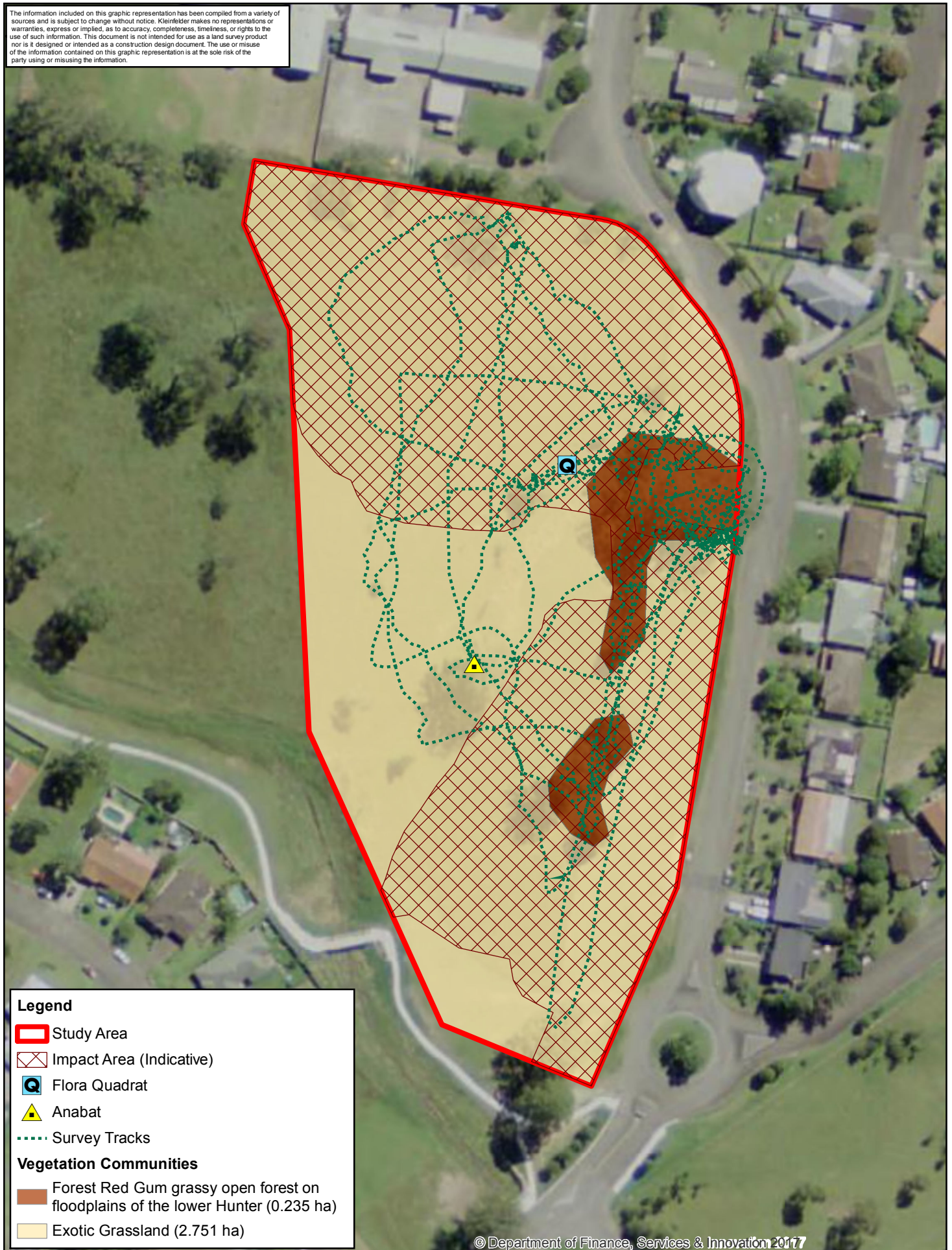
Table 2: Hollow-bearing trees and Dead Stags within the study area

Tree No.	Tree Species	No. of Hollows / Size Class			Comments
		Small	Medium	Large	
1.	<i>Eucalyptus moluccana</i>	2	1	-	HBT1 – proposed to be removed
2.	<i>Eucalyptus moluccana</i>	-	2	-	HBT2 - proposed to be removed
3.	<i>Eucalyptus moluccana</i>	2	-	-	HBT3 - proposed to be removed
4.	<i>Eucalyptus moluccana</i>	-	1	-	HBT4 – proposed to be retained
5.	<i>Eucalyptus moluccana</i>	1	1	-	HBT5 – proposed to be retained
6.	<i>Eucalyptus moluccana</i>	-	1	-	HBT6 – proposed to be retained
7.	Dead Stag	-	-	-	S1 - proposed to be removed
8.	Dead Stag	-	-	-	S2 - proposed to be removed
9.	Dead Stag	-	-	-	S3 - proposed to be removed

3.2.4.1 SEPP 44 – Koala Habitat



Two feed trees listed under Schedule 2 of SEPP 44 occur within the study area; *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Redgum). These species constitute greater than 15% of the canopy trees within the study area. However, while potential Koala feed trees were identified within the study area, the site is not considered to provide habitat for the Koala due to the extremely fragmented and disturbed nature of the trees within the site, and the highly urban nature of the surrounds. The feed trees located within the site occur as isolated paddock trees or small stands which are not connected to surrounding vegetation. Were Koalas to utilise these trees as a resource, it would require them to traverse large distances on foot, which is considered highly unlikely considering their vulnerability when on the ground.

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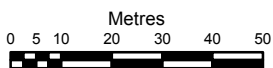
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Legend

-  Study Area
-  Impact Area (Indicative)
-  Flora Quadrat
-  Anabat
-  Survey Tracks

Vegetation Communities

-  Forest Red Gum grassy open forest on floodplains of the lower Hunter (0.235 ha)
-  Exotic Grassland (2.751 ha)



PROJECT REFERENCE: 20190322

DATE DRAWN: 10/05/2018 10:56 Version 1

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DFSI - 2017

Vegetation Communities and Survey Effort

Anglican Care
Ecological Impact Assessment
Proposed Residential Aged Care Facility
and Independent Living Units
1 – 25 Clement Street, Gloucester NSW

FIGURE:

3



4. IMPACT ASSESSMENT

4.1 SUMMARY OF IMPACTS

4.1.1 Native Vegetation

The proposal will require the removal of 0.16 ha of the Forest Redgum grassy open forest. This community is already in a degraded and disturbed form and is a relatively small and fragmented patch. The proposal will also directly impact on 2.02 ha of Exotic Grassland within the study area, within which are several native remnant trees and saplings.

Indirect impacts to the native vegetation on site are likely to occur also, in the form of increased dust and sedimentation during the construction phase, however this is unlikely to significantly impact upon the vegetation to be retained.

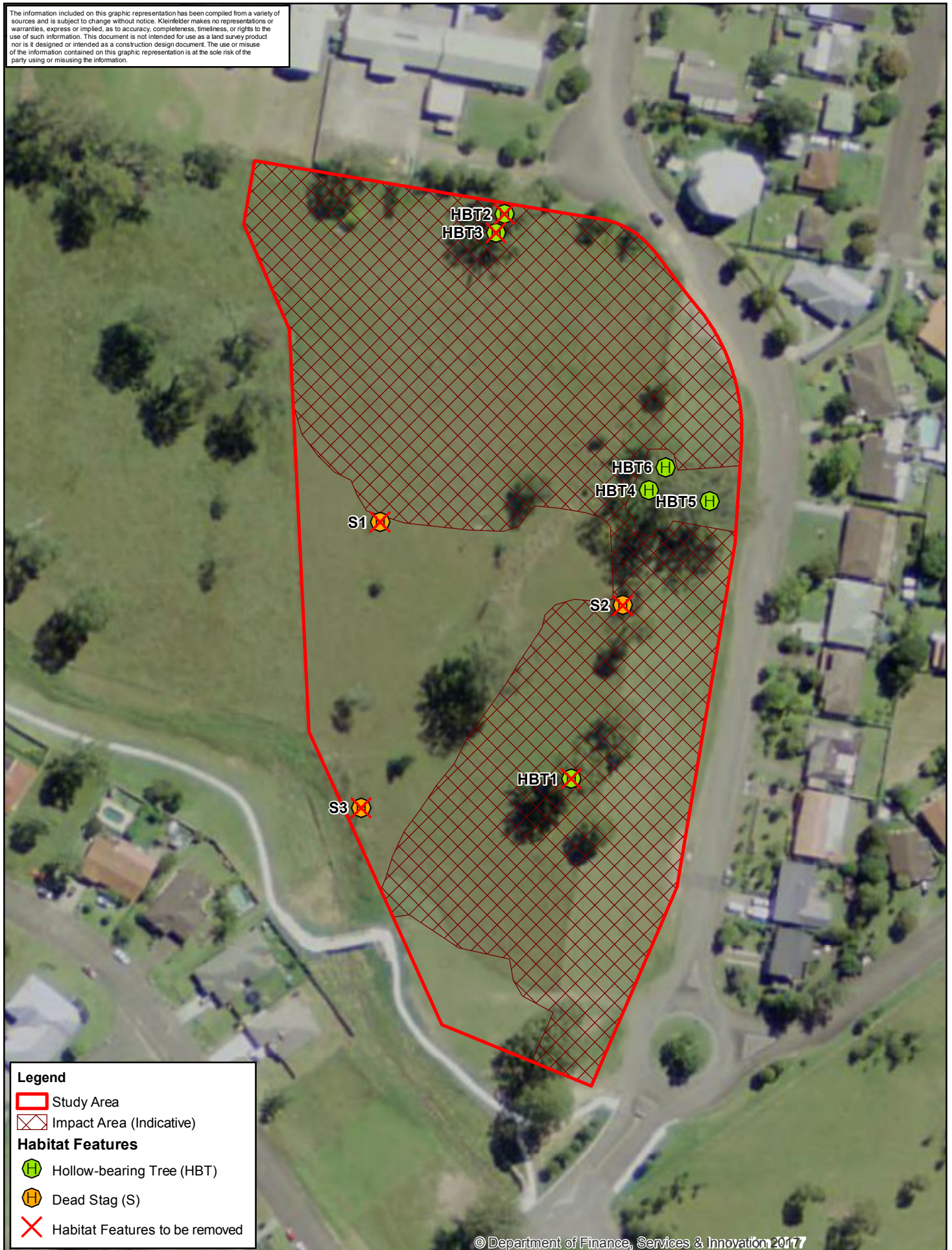
Implementation of the mitigation measures proposed in **Section 5** will reduce indirect impacts to the retained vegetation.

4.1.2 Fauna and Fauna Habitat

The proposal will require the removal of 0.16 ha of native vegetation, which is likely to provide roosting and foraging habitat for a variety of local birds, Common Brushtail Possum and bat species. The proposal will also require the removal of 2.02 ha of Exotic Grassland, which may provide foraging habitat for more common bird species and microchiropteran bat species. While the native vegetation and fauna habitat to be retained is likely to become even more fragmented and isolated, it is already degraded from historical clearing and its habitat value for anything more than common, urban-dwelling species is marginal.

Additionally, three hollow-bearing trees, containing four small and three medium hollows would be removed as part of the proposal, as well as three dead stags.

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Legend

- Study Area
- Impact Area (Indicative)

Habitat Features

- H Hollow-bearing Tree (HBT)
- S Dead Stag (S)
- X Habitat Features to be removed

Metres
0 5 10 20 30 40 50

N

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PROJECT REFERENCE: 20190322
DATE DRAWN: 10/05/2018 10:59 Version 1
DRAWN BY: gjoyce
DATA SOURCE: DFS1 - 2017

**Habitat Features
and Impact Area**

Anglican Care
Ecological Impact Assessment
Proposed Residential Aged Care Facility
and Independent Living Units
1 – 25 Clement Street, Gloucester NSW

FIGURE:

4

4.1.3 Threatened Species and Communities

4.1.3.1 Assessment of Likelihood of Occurrence

An assessment of the likelihood of each of the threatened species and ecological communities recorded and/or modelled to occur within a 5 km radius of the study area is provided in **Appendix 1**.

The assessment identified that five threatened mammal species have the potential to be impacted by the proposal. Three EPBC Act-listed migratory species were also considered to be potentially impacted by the proposal. Additionally, one threatened ecological community was assessed as being impacted by the proposal.

Where any habitat used by these threatened species and ecological communities are likely to be directly or indirectly affected by the proposal, these are deemed 'affected species' and an assessment of significance was applied (**Appendix 5**).

4.1.3.2 Biodiversity Conservation Act 2016

Section 7.3 of the BC Act provides a '*test for determining whether proposed development or activity likely to significantly affect threatened species or ecological communities, or their habitats*'. The assessment was undertaken in accordance with The Threatened Species Assessment Guideline – the Assessment of Significance (DECCW 2007). An assessment of significance has been prepared for each species of threatened flora and fauna, and ecological community potentially impacted by the proposal. Detailed assessments are documented in **Appendix 5** and a summary of the conclusions are provided below.

Threatened Species

Five threatened fauna species listed under the BC Act have the potential to be impacted on by the proposal due to the presence of suitable foraging and roosting habitat; Eastern Free-tail Bat, Little Bentwing-bat, Eastern Bentwing-bat, Southern Myotis and Yellow-bellied Sheath-tail-bat. All of the above species (aside from the Southern Myotis) were detected within the study area.

Assessments of Significance (**Appendix 5**) concluded that the proposal is unlikely to have a significant impact on these species due to the removal of a degraded, fragmented patch of Forest Redgum grassy open forest (0.16 ha), and the removal of exotic grassland (2.02 ha).

The study area is already in a degraded and fragmented state due to historical clearing, and similar habitat is present to the west of the site. A total of 0.8 ha of habitat would be retained within the study area.

The preparation of a Species Impact Statement for the proposal is not required.

Ecological Communities

A total area of 0.24 ha of *Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast bioregions* EEC is present within the study area, with 2.02 ha proposed to be removed. However, this community is already in a degraded, disturbed and fragmented state, and its removal is not considered important to the survival of the community in the locality.

Assessments of Significance concluded that the proposal is unlikely to have a significant impact on this threatened ecological community (**Appendix 5**). Therefore, the preparation of a Species Impact Statement is not required.

4.1.3.3 Environment Protection and Biodiversity Conservation Act 1999

Migratory Species

There is suitable habitat for three migratory species within the study area (Cattle Egret, Oriental Cuckoo and White-throated Needletail). The proposal would result in the removal of 0.16 ha of potential habitat for the Oriental Cuckoo, in the form of the Forest Redgum grassy open forest. The Cattle Egret may potentially utilise the Exotic Grassland for foraging, of which 2.02 ha is proposed for removal. Habitat for both species would still be present within the study area however, with 0.07 ha of Forest Redgum grassy open forest and 0.73 ha of Exotic Grassland to be retained, and similar vegetation occurring in the adjacent land to the west. Given the already degraded and fragmented nature of the vegetation in the study area, the proposed development is unlikely to significantly impact on migrant populations of these species occurring in the locality. Lastly, the White-throated Needletail is only anticipated to aerially forage above the study area, with impacts therefore likely to be minimal and indirect, and would consist of an increase in human activity and noise in the short-term.

This was determined following consideration of the significant impact criteria for Migratory Species in the EPBC Significant Impact Guidelines which states that an action is significant if it will:

substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species; result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or; seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species (DoE, 2013).

Therefore, a referral to the Commonwealth Minister for the Environment is not considered necessary.

5. RECOMMENDATIONS

The following recommendations are considered necessary to protect the integrity of the vegetation and habitat features within and adjacent to the study area:

- Where possible, trees within the study area (dead or alive) should be retained as these trees will still provide valuable habitat to a range of local fauna species.
- The construction site should be managed so that no accidental incursions occur into vegetation or trees to be retained. This would be best achieved by clearly marking the extent of development and via the installation of temporary exclusion fences where practical.
- Best practice erosion and sedimentation control methods should be adopted, enforced and maintained throughout any earthworks during the construction phase to avoid having a negative impact on the surrounding environment.
- The use of insecticides and herbicides within the study area should be avoided where possible to reduce the potential impact on surrounding vegetation and retain the integrity of habitat for insectivorous bat, bird and amphibian species; and
- Weed control within areas of retained vegetation within the study area is recommended to enhance the retained vegetation and prevent deterioration of threatened species' habitat:
 - Control of *Senecio madagascariensis* (Fireweed), *Asparagus asparagoides* (Ground Asparagus) and *Notelaea europaea* subsp. *cuspidata* (African Olive) is required to be undertaken as these are WONS;
 - Any other exotic species should be controlled, as required;
 - All weed control works are to be undertaken by a suitably qualified contractor/individual with appropriate plant identification skills;
 - Weed control works in native vegetation communities are to be conducted in accordance with the Bradley method described by Buchanan (1999). This method aims to remove weeds with minimal disturbance and allow native species to re-establish naturally from the existing seed bank and rootstock. The following steps are to be followed when controlling weeds on the site:
 - The weed removal team will require a site-specific induction, to understand what weeds are to be removed, the process of removal, identification of the native species, and the procedures to be followed;
 - Manual weed removal: Where there is native understorey present, dominant weeds will need to be manually treated within the existing forest area where possible;

- Weed vegetative material collected during weed control activities is to be taken offsite (where practical). This will stop weed material smothering native plants and prevent re-establishment. This material is to be taken to an appropriate waste disposal centre to prevent further weed spread in the region; and
- Chemical weed control: Chemical should be applied only where application to larger weeds can be isolated (i.e. no broad application). No spraying should be conducted in ecologically sensitive areas of the site (i.e. high potential of spraying native species).
- o For concentrations and dosage rates on targeted chemical control, refer to the 'Noxious and Environmental Weed Control Handbook' (Ensbey, 2014). Any weed spraying should be conducted by an authorised person, having a Chemical Application Certificate or similar qualification. This would ensure that best practice is adhered to in consideration of the ecological sensitivities within and adjoining the study area.

6. REFERENCES

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APPENDIX 1. ASSESSMENT OF LIKELIHOOD OF OCCURRENCE

The table below summarises the likelihood of threatened species and EPBC Act listed migratory species occurring within the study area based on the habitat requirements of each species. A brief definition of the likelihood of occurrence criteria is provided below:

- Known – species identified within the site during surveys;
- High – species known from the area (OEH Wildlife Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site;
- Moderate – species may be known from the area, potential habitat is present within the site;
- Low – species not known from the area and/or marginal habitat is present within the site; and
- Nil – habitat requirements not met for this species within the site.

An assessment of the likelihood of threatened species and ecological communities occurring within the study area

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
Flora								
1.	<i>Asperula asthenes</i> Trailing Woodruff	V	V	1	OEH Atlas	Occurs in damp sheltered sites, often along river banks. No suitable habitat within the study area.	Nil	No
2.	<i>Cynanchum elegans</i> White-flowered Wax Plant	E	E	1	OEH Atlas, PMST	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree <i>Leptospermum laevigatum</i> – Coastal Banksia <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> coastal scrub; Spotted Gum <i>Corymbia maculata</i> aligned open forest and woodland; and Bracelet Honey myrtle <i>Melaleuca armillaris</i> scrub to open scrub. No suitable habitat within the study area.	Nil	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
3.	<i>Dichanthium setosum</i> Bluegrass	V	V	-	PMST	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Study area contains suitable habitat for this species, however overstorey species assemblage on the site is not the typical habitat for this species (OEH 2017)^. Also, species not known from the locality.	Low	No
4.	<i>Eucalyptus glaucina</i> Slaty Redgum	V	V	1	OEH Atlas, PMST	Grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils. Habitat within the study area is potentially suitable for this species, however it was not detected within the site.	Nil	No
5.	<i>Eucalyptus largeana</i> Craven Grey Box	E	-	3	OEH Atlas	Often found in wet forest on subcoastal ranges. No suitable habitat within the study area. Species not detected during field surveys.	Nil	No
6.	<i>Euphrasia arguta</i> -	CE	CE	-	PMST	Around Bathurst this species has been found in the open forest country in sub humid places, on the grassy country, and in meadows near rivers. Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey. Unsuitable habitat within the study area. Species not known from the locality.	Nil	No
7.	<i>Haloragis exalata</i> subsp. <i>velutina</i> Tall Velvet Sea- berry	V	V	-	PMST	Grows in damp places near watercourses. This subspecies also occurs in woodland on the steep rocky slopes of gorges. Unsuitable habitat within the study area. Species not known from the locality.	Nil	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
8.	<i>Pomaderris queenslandica</i> Scant Pomaderris	E	-	2	OEH Atlas	Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks. No suitable habitat within the study area. Species not detected during field surveys.	Nil	No
9.	<i>Syzygium paniculatum</i> Magenta Lilly Pilly	E	V	-	PMST	Grows on sandy soils in subtropical and littoral rainforest near the coast from Bulahdelah to Jervis Bay. No suitable habitat within the study area. Species not detected during field surveys.	Nil	No
10.	<i>Thesium australe</i> Austral Toadflax	V	V	-	PMST	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. No suitable habitat within the study area. Species not known from the locality.	Nil	No
Threatened Ecological Communities								
1.	<i>Lowland Rainforest of Subtropical Australia</i>	E	CE	-	PMST	Not present within the study area.	Nil	No
2.	<i>Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions</i>	E	-	-	Site Survey	Detected within the study area.	Known	Yes
Amphibians								

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
1.	<i>Litoria booroolongensis</i> Booroolong Frog	E	E	-	PMST	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. No suitable habitat within the study area. Species not known from the locality.	Nil	No
2.	<i>Mixophyes balbus</i> Stuttering Frog	E	V	-	PMST	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. No suitable habitat within the study area. Species not known from the locality.	Nil	No
Birds								
1.	<i>Anthochaera phrygia</i> Regent Honeyeater	CE	CE	-	PMST	Mostly recorded in box-ironbark eucalypt associations. At times of food shortage, the species also uses other woodland types and wet lowland coastal forest dominated by Swamp Mahogany or Spotted Gum. Suitable habitat within the study area due to the presence of Box and Ironbark species. However, species not known from the locality.	Low	No
2.	<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E	-	PMST	Occurs in reeds and marshes in terrestrial freshwater wetlands and, occasionally estuarine habitats. Nests in stands of <i>Phragmites</i> , <i>Typha</i> , and rushes (<i>Juncus</i> , <i>Baumea</i> spp.). Habitat within the study area is not suitable for this species, and species not known from the locality.	Nil	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
3.	<i>Circus assimilis</i> Spotted Harrier	V	-	1	OEH Atlas	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. Marginal habitat within the study area but likely far too urban and disturbed for this species.	Low	No
4.	<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	V	-	1	OEH Atlas	Found in eucalypt woodlands (including Box-Gum Woodland); mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Redgum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging. Habitat within the study area is not suitable for this species due to a lack of rough-barked Eucalypts and fallen timber.	Nil	No
5.	<i>Dasyornis brachypterus</i> Eastern Bristlebird	E	E	-	PMST	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. Habitat and location is unsuitable for this species.	Nil	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
6.	<i>Ephippiorhynchus asiaticus</i> Black-necked Stork	E	-	14	OEH Atlas	Black-necked Storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. No suitable habitat for this species within the study area as no water present.	Nil	No
7.	<i>Grantiella picta</i> Painted Honeyeater	V	V	-	PMST	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. The primary food source for this bird is the fruit and flowers of mistletoes in the genus Amyema, though it will also take some nectar and insects. Marginal habitat due to lack of contiguous woodland and forest vegetation, and lack of mistletoes. Species not known from the locality.	Low	No
8.	<i>Lathamus discolor</i> Swift Parrot	CE	CE	-	PMST	This migratory species has been recorded on the mainland from a variety of habitat types including dry and wet sclerophyll forest, forested wetlands, coastal swamp forests and heathlands. Marginal foraging habitat within study area while Eucalypt species flowering, however species not known from the locality. No breeding habitat as this species does not breed on the mainland. No habitat within the study area.	Low	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
9.	<i>Ninox strenua</i> Powerful Owl	V	-	1	OEH Atlas	<p>The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine, Black She-oak, Blackwood, Rough-barked Apple, Cherry Ballart and a number of eucalypt species. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.</p> <p>Marginal foraging habitat only within study area as prey species are likely to be sparse due to lack of suitable habitat. No suitable nesting hollows present within the study area (too small).</p>	Low	No
10.	<i>Pomatostomus temporalis temporalis</i> Grey-crowned Babbler (eastern subspecies)	V	-	24	OEH Atlas	<p>Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.</p> <p>Overstorey trees are suitable for this species however the lack of connecting vegetation, leaf litter, logs and understorey means that the study area provides very little foraging habitat. Also, no old nests present at time of survey.</p>	Low	No
11.	<i>Rostratula australis</i> Australian Painted Snipe	E	E	-	PMST	<p>Inhabits shallow, vegetated, temporary or infrequently filled wetlands, often seen feeding at the water's edge or on mudflats.</p> <p>No suitable habitat for this species. Species not known from the locality.</p>	Nil	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
Mammals								
1.	<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	1	OEH Atlas, PMST	Prefers dry forest close to sandstone ridgelines. No suitable habitat within the study area.	Nil	No
2.	<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V	E	1	OEH Atlas, PMST	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. No suitable habitat within the study area and locality too urban and disturbed for this species. Only one record of the species in the locality which is very old (> 20 yrs).	Nil	No
3.	<i>Miniopterus australis</i> Little Bentwing-bat	V	-	1	OEH Atlas	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally, found in well-timbered areas. Detected within the study area.	Known	Yes
4.	<i>Miniopterus schreibersii oceanensis</i> Eastern Bentwing-bat	V	-	1	OEH Atlas	Forages in forested habitats. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Detected within the study area.	Known	Yes
5.	<i>Mormopterus norfolkensis</i> Eastern Freetail-bat	V	-	3	OEH Atlas	Inhabits dry sclerophyll forest and woodland, where it hunts for insects above the canopy or within clearings at forest edges. This species normally roosts in tree hollows or under loose bark on a variety of tree species. Detected within the study area.	Known	Yes

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
6.	<i>Myotis macropus</i> Southern Myotis	V	-	1	OEH Atlas	Generally roost 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. Typically occurs in vegetated areas. Roosting habitat available within the hollow-bearing trees. No foraging habitat available within the study area as no water present, however there is a dam in the land to the west. Therefore, foraging habitat available in the vicinity.	Moderate	Yes
7.	<i>Petauroides Volans</i> Greater Glider	-	V	-	PMST	Open woodland and tall forests where there is suitable eucalypt trees. Rests in hollow trees during the day and feeds at night. No suitable habitat within the study area due to a lack of tall <i>Eucalypt</i> forest and urban nature of the site.	Nil	No
8.	<i>Petaurus norfolcensis</i> Squirrel Glider	V	-	1	OEH Atlas	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Redgum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Typically require an intact midstorey containing foraging resources such as <i>Banksia sp</i>, which is not present within the study area. Disturbed and urban nature of the site is not suitable for this species. No habitat within the study area.	Nil	No
9.	<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	E	V	-	PMST	Occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. No suitable habitat within the study area and no records of the species in the locality.	Nil	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
10.	<i>Phascolarctos cinereus</i> Koala	V	V	11	OEH Atlas, PMST	Found in a variety of forest types with suitable feed tree species. Suitable feed tree species found within the study area (<i>Eucalyptus tereticornis</i> and <i>Eucalyptus moluccana</i>). However, feed tree species occur as isolated stands or individual trees in an urban, disturbed environment, which is not suitable for this species. No habitat within the study area.	Low	No
11.	<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	V	-	3	OEH Atlas	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Study area is considered to be too urban and fragmented for this species. No suitable habitat within the study area.	Nil	No
12.	<i>Potorous tridactylus tridactylus</i> Long-nosed Potoroo (SE Mainland Population)	V	V	-	PMST	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. No suitable habitat within the study area. Species not known from the locality.	Nil	No
13.	<i>Pseudomys novaehollandiae</i> New Holland Mouse	-	V	-	PMST	Inhabits open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. No suitable habitat within the study area. Species not known from the locality.	Nil	No

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
14.	<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	-	PMST	Occurs across a wide range of habitat types along the eastern seaboard of Australia, depending on food availability. Fruit from myrtaceous trees and rainforest trees form the major components of their diet. Potential foraging habitat within the study area when Eucalypt species flowering, however species not known from the locality.	Low	No
15.	<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V	-	1	OEH Atlas	Forages in most habitats across its very wide range, with and without trees. Appears to defend an aerial territory. Detected within the study area.	Known	Yes
16.	<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	V	-	1	OEH Atlas	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Marginal habitat within the study area due to the disturbed and urban nature.	Low	No
Migratory Species								
1.	<i>Ardea ibis</i> Cattle Egret	-	M	7	OEH Atlas	Inhabits moist pastures, shallow open wetlands. Potential habitat within the study area in the exotic grassland.	Moderate	Yes
2.	<i>Cuculus optatus</i> Oriental Cuckoo	-	M	-	PMST	Occurs at rainforest edges, leafy trees in paddocks, river flats, roadsides and mangroves Potential habitat within the Forest Redgum grassy open forest and isolated trees within the study area.	Moderate	Yes
3.	<i>Hirundapus caudacutus</i> White-throated Needle-tail	-	M	1	OEH Atlas, PMST	Forages in high open spaces over varied habitat types. Potential aerial foraging habitat above study area.	Moderate	Yes

No.	Species	Legal Status*		No. of Records	Source#	Habitat Preferences	Likelihood of occurrence	Assessment Required?
		BC Act	EPBC Act					
4.	<i>Merops ornatus</i> Rainbow Bee-eater	-	M	1	OEH Atlas	Found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels. Marginal habitat within the study area due to limited vegetation, and only record of this species in the locality is very old (> 20 yrs).	Low	No
5.	<i>Monarcha melanopsis</i> Black-faced Monarch	-	M	-	PMST	Found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. No suitable habitat within the study area.	Nil	No
6.	<i>Monarcha trivirgatus</i> Spectacled Monarch	-	M	-	PMST	Inhabits the understorey of mountain/ lowland rainforests, thickly wooded gullies and waterside vegetation including mangroves. No suitable habitat within the study area.	Nil	No
7.	<i>Motacilla flava</i> Yellow Wagtail	-	M	-	PMST	Typically inhabits inundated fields, saltmarsh and wetlands and occasionally coastal areas. No suitable habitat within the study area.	Nil	No
8.	<i>Myiagra cyanoleuca</i> Satin Flycatcher	-	M	-	PMST	Found in tall forests, preferring wetter habitats such as heavily forested gullies. No suitable habitat within the study area.	Nil	No
9.	<i>Rhipidura rufifrons</i> Rufous Fantail	-	M	-	PMST	Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. No suitable habitat within the study area.	Nil	No

* Legal Status: V = Vulnerable, E = Endangered, CE = Critically Endangered under BC Act and EPBC Act; M = Migratory under EPBC Act.

Source: OEH Atlas = Atlas of NSW Wildlife (OEH), PMST = Protected Matter Search Tool (Australian Government).

^ Source: OEH Bionet (2017). *Bluegrass - Profile* [online] available at: <http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10221>

APPENDIX 2. FLORA SPECIES LIST

No.	Family	Scientific Name	Common Name	Quadrat 1	
Weeds of National Significance Under the Biosecurity Act 2015				% FC	A
1.	Asparagaceae	<i>Asparagus aethiopicus</i>	Ground Asparagus		-
2.	Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	0.1	5
3.	Oleaceae	<i>Notelaea europaea</i> subsp. <i>cuspidata</i>	African Olive		-
Introduced Species				% FC	A
1.	Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	0.1	10
2.	Apocynaceae	<i>Vinca major</i>	Greater Periwinkle		-
3.	Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	0.1	3
4.	Asteraceae	<i>Conyza bonariensis</i>	Fleabane	0.1	10
5.	Asteraceae	<i>Hypochaeris radicata</i>	Flatweed	0.1	5
6.	Asteraceae	<i>Onopordum acanthium</i>	Scotch Thistle		-
7.	Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle		-
8.	Asteraceae	<i>Taraxacum officinale</i>	Dandelion	0.1	5
9.	Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	0.2	10
10.	Pinaceae	<i>Pinus radiata</i>	Radiata Pine	1	1
11.	Poaceae	<i>Andropogon virginicus</i>	Whisky Grass		-
12.	Poaceae	<i>Axonopus fissifolius</i>	Narrow- leaved Carpet Grass	0.2	20
13.	Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu	20	500
14.	Poaceae	<i>Chloris gayana</i>	Rhodes Grass	25	500
15.	Poaceae	<i>Cynodon dactylon</i>	Common Couch	0.1	5
16.	Poaceae	<i>Ehrharta erecta</i>	Ehrharta	20	500
17.	Poaceae	<i>Setaria pumila</i>	Pale Pigeon Grass	0.3	20
18.	Poaceae	<i>Paspalum dilatatum</i>	Paspalum	0.3	20
19.	Poaceae	<i>Paspalum urvillei</i>	Vasey Grass	0.2	10
20.	Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass	0	1000
21.	Solanaceae	<i>Solanum nigrum</i>	Blackberry Nightshade	0.1	2
22.	Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	0.1	10
Native Species				% FC	A
1.	Apiaceae	<i>Centella asiatica</i>	Indian Pennywort	0.2	100
2.	Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed	0.1	5
3.	Commelinaceae	<i>Commelina cyanea</i>	-	0.1	2
4.	Convolvulaceae	<i>Convolvulus erubescens</i>	Blushing Bindweed		-

No.	Family	Scientific Name	Common Name	Quadrat 1	
5.	Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	0.1	10
6.	Cyperaceae	<i>Cyperus gracilis</i>	-		-
7.	Fabaceae - Faboideae	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea		-
8.	Fabaceae - Faboideae	<i>Hardenbergia violacea</i>	Purple Coral Pea		-
9.	Fabaceae - Mimosoideae	<i>Acacia ulicifolia</i>	Prickly Moses		-
10.	Haloragaceae	<i>Fimbristylis dichotoma</i>	Common Fringe Sedge		-
11.	Hypericaceae	<i>Hypericum gramineum</i>	Small St. John's Wort	0.1	10
12.	Juncaceae	<i>Juncus usitatus</i>	-		-
13.	Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot		-
14.	Malvaceae	<i>Brachychiton populneus</i>	Kurrajong		-
15.	Meliaceae	<i>Melia azedarach</i>	White Cedar		-
16.	Myrtaceae	<i>Eucalyptus crebra</i>	Narrow- leaved Ironbark		-
17.	Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Redgum	0.5	2
18.	Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box		-
19.	Pittosporaceae	<i>Bursaria spinosa</i>	Blackthorn		-
20.	Plantaginaceae	<i>Veronica plebeia</i>	Trailing Speedwell		-
21.	Poaceae	<i>Capillipedium parviflorum</i>	Scented Top Grass		-
22.	Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass	0.1	10
23.	Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass		-
24.	Poaceae	<i>Microlaena stipoides</i>	-		-
25.	Poaceae	<i>Themeda triandra</i>	Kangaroo Grass		-
26.	Vitaceae	<i>Cayratia clematidea</i>	Native Grape		-

APPENDIX 3. FAUNA SPECIES LIST

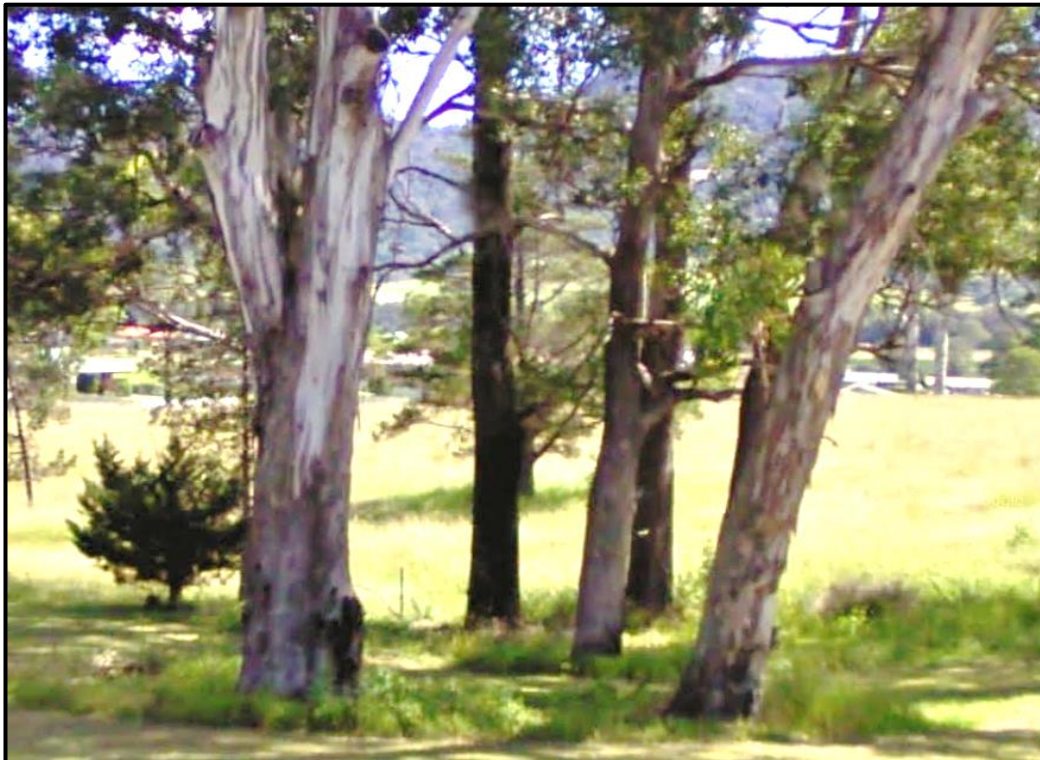
No.	Family	Scientific Name	Common Name
1.	Amphibia	<i>Litoria fallax</i>	Eastern Dwarf Tree Frog
2.	Aves	<i>Acridotheres tristis*</i>	Common Myna
3.	Aves	<i>Alisterus scapularis</i>	Australian King Parrot
4.	Aves	<i>Anthochaera carunculata</i>	Red Wattlebird
5.	Aves	<i>Cacatua sanguinea</i>	Little Corella
6.	Aves	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
7.	Aves	<i>Corvus coronoides</i>	Australian Raven
8.	Aves	<i>Cracticus tibicen</i>	Australian Magpie
9.	Aves	<i>Cracticus torquatus</i>	Grey Butcherbird
10.	Aves	<i>Eolophus roseicapilla</i>	Galah
11.	Aves	<i>Falco peregrinus</i>	Peregrine Falcon
12.	Aves	<i>Hirundo neoxena</i>	Welcome Swallow
13.	Aves	<i>Manorina melanocephala</i>	Noisy Miner
14.	Aves	<i>Ocyphaps lophotes</i>	Crested Pigeon
15.	Aves	<i>Pardalotus punctatus</i>	Spotted Pardalote
16.	Aves	<i>Platycercus eximius</i>	Eastern Rosella
17.	Aves	<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted Lorikeet
18.	Aves	<i>Trichoglossus moluccanus</i>	Rainbow Lorikeet
19.	Aves	<i>Vanellus miles</i>	Masked Lapwing
20.	Mammalia	<i>Austronomus australis</i>	White-striped Freetail-bat
21.	Mammalia	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
22.	Mammalia	<i>Chalinolobus morio</i>	Chocolate Wattled Bat
23.	Mammalia	<i>Miniopterus australis+</i>	Little Bentwing-bat
24.	Mammalia	<i>Miniopterus schreibersii oceanensis+</i>	Eastern Bentwing-bat
25.	Mammalia	<i>Mormopterus norfolkensis+</i>	Eastern Freetail-bat
26.	Mammalia	<i>Mormopterus ridei</i>	Eastern Free-tailed Bat
27.	Mammalia	<i>Saccolaimus flaviventris+</i>	Yellow-bellied Sheath-tail-bat
28.	Mammalia	<i>Scotorepens orion</i>	Eastern Broad-nosed Bat
29.	Mammalia	<i>Vespadelus pumilus</i>	Eastern Forest Bat
30.	Mammalia	<i>Vespadelus vulturnus</i>	Little Forest Bat

+denotes a listed threatened species listed as Vulnerable under the BC Act and the EPBC Act

*Denotes an introduced species

APPENDIX 4. VEGETATION COMMUNITY DESCRIPTIONS

Forest Redgum grassy open forest on floodplains of the lower hunter



Mature *Eucalyptus moluccana* and *E. tereticornis* within the Forest Redgum Grassy open forest in the study area

Corresponding OEH PCT (OEH 2017): PCT ID 831: Forest Red Gum – Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin Bioregion.

Conservation Status in NSW: The Forest Redgum Grassy Open Forest within the study area forms part of the *Hunter Lowland Redgum Forest of the Sydney Basin and NSW North Coast bioregions* EEC listed under the BC Act. Inclusion of this community in the study area within the EEC was determined through comparison with the NSW Scientific Committee's Determination (2011). The community conforms in locality, position in the landscape and dominant floristic structure (modified and degraded due to historical clearing).

National Conservation Status: Not Listed.

Structure: Within the study area this community exists as fragmented trees only, as a mixture of remnant trees to 20 m and regenerated saplings.

General Description: Within the study area this community is dominated by *Eucalyptus moluccana* (Grey Box) and *Eucalyptus tereticornis* (Forest Redgum) in the canopy, with isolated *E. crebra* (Narrow-leaved Ironbark) also occurring. No midstorey or shrub layer is present due to historical clearing. The ground cover consists largely of exotic grass species such as *Chloris gayana* (Rhodes Grass), *Sporobolus africanus* (Parramatta Grass), *Paspalum dilatatum* (Paspalum) and *Ehrharta erecta*. Occasional native herbs are present in the ground layer including *Einadia trigonos* (Fishweed), *Centella asiatica*, *Dichondra repens* (Kidney Weed) and *Hypericum gramineum* (Small St. John's Wort).

Condition: This community consists of a native canopy layer over a disturbed and exotic ground cover layer. In addition to those already mentioned, there are several weeds listed as WONS under the *Biosecurity Act 2015* occurring within this community, including *Asparagus asparagoides* (Ground Asparagus), *Notelaea europaea* subsp. *cuspidata* (African Olive) and *Senecio madagascariensis* (Fireweed).

Distribution within the Study area: This community is present adjacent to the eastern boundary of the study area.

Exotic Grassland



Exotic Grassland containing isolated remnant trees within the study area.

Corresponding OEH PCT (OEH 2017): None

Conservation Status in NSW: Not Listed.

National Conservation Status: Not Listed.

Structure: Open exotic grassland containing isolated stands of remnant trees and Eucalypt saplings.

General Description: This community is dominated by exotic grass species *Chloris gayana* (Rhodes Grass), *Sporobolus africanus* (Parramatta Grass), *Paspalum dilatatum* (Paspalum), *Setaria pumila* (Pale Pigeon Grass) and *Ehrharta erecta*. Occasional native grass and herb species are present, including *Cymbopogon refractus* (Barbed Wire Grass), *Themeda triandra* (Kangaroo Grass), *Hypericum gramineum* and *Einadia trigonos*. This community also contains isolated *Eucalyptus moluccana*, *E. crebra*, *E. tereticornis* and *Pinus radiata* (Radiata Pine).

Condition: This community is in poor condition with almost complete coverage by exotic species.

Distribution within the Study area: This community occurs across the majority of the study area.

References

NSW Scientific Committee (2011). *Hunter lowland redgum forest in the Sydney Basin and NSW North Coast bioregions - endangered ecological community listing*. Office of Environment and Heritage Website, Updated: 28 Feb 2011, Available: <http://www.environment.nsw.gov.au/determinations/HunterLowlandRedgumForestEndComListing.htm>

APPENDIX 5. ASSESSMENTS OF SIGNIFICANCE

Biodiversity Conservation Act 2016

Factors of Assessment

The five factors considered in the assessment of significance (s5AA of EP&A Act) are shown in the table below. The assessments of significance for all threatened species and ecological communities considered likely to occur within the study area are provided in the following sub-sections.

Factors addressed in the assessment of significance

Factor	Species	Ecological Community
(a) <i>in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.</i>	X	
(b) <i>in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:</i> <i>(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or</i> <i>(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</i>		X
(c) <i>in relation to the habitat of a threatened species or ecological community:</i> <i>(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i> <i>(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i> <i>(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality</i>	X	X
(d) <i>whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)</i>	NA	NA
(e) <i>whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process</i>	X	X

Threatened Ecological Communities

Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions

(b) (i) Extent	The study area contains a total area of 0.24 ha of Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast bioregions. 0.16 ha of this vegetation community is proposed to be removed, however this community is already extremely fragmented and degraded. A very minor proportion (0.07 ha) of this community is proposed to be retained within the study area. This community is also mapped as occurring to the west of the study area (NPWS 2000). Therefore, while the majority of the community in the study area is to be removed, as it occurs in a degraded and fragmented state, this is unlikely to significantly impact the vegetation community as a whole in the locality.
(b) (ii) Composition	The EEC within the study area has been previously modified through historical clearing. It contains no midstorey and contains an exotic understorey. Therefore, the removal of 0.16 ha of this already degraded community is unlikely to significantly impact the composition of the community both within the study area, and within the locality as a whole. Implementation of the mitigation measures in Section 5 will assist in preventing indirect impacts from affecting the retained vegetation.
(c) (i) Habitat Removal	A minor area (0.16 ha) of already degraded and disturbed habitat would be removed for this community, with 0.07 ha to be retained.
(c) (ii) Habitat Fragmentation	This community within the study area is already highly fragmented, and occurs as an isolated island surrounded by exotic grassland. While removal of 0.16 ha of this community would result in greater fragmentation, the effects of this are unlikely to be significant as the vegetation exists in a degraded state in an urban environment.
(c) (iii) Habitat importance	The habitat to be removed is already degraded and disturbed and is not considered important to the survival of this community in the locality.
(e) KTP	<p>The proposal will result in the following key threatening processes:</p> <ul style="list-style-type: none"> • Clearing of native vegetation; • Loss of hollow- bearing trees; and • Removal of dead wood and dead trees. <p>The proposal may result in the following key threatening processes:</p> <ul style="list-style-type: none"> • Anthropogenic climate change; • Invasion of native plant communities by exotic perennial grasses; • Infection of native plants by <i>Phytophthora cinamomi</i>; and • Introduction and establishment of exotic rust fungi of the order <i>Pucciniales</i> pathogenic on plants of the order <i>Myrtaceae</i>.
Conclusion	The Hunter Lowland Redgum Forest in the study area is already highly degraded, disturbed and fragmented from any other native vegetation. Therefore, the proposed removal of 0.16 ha of this community is not considered likely to significantly impact upon the extent or composition of this community in the locality, such that it would become locally extinct. Implementation of the recommendations in Section 5 will also reduce any indirect impacts upon the community to be retained.

Threatened Fauna Species

Microchiropteran Bat Species

- Little Bentwing-bat
- Eastern Bentwing-bat
- Eastern Freetail-bat
- Southern Myotis
- Yellow-bellied Sheath-tail-bat

(a) Effect on life cycle	The study area represents potential foraging habitat across the study area for the above bat species. Roosting habitat is available within the Forest Redgum grassy open forest and in the isolated trees within the exotic grassland. The removal of 2.18 ha of foraging and roosting habitat within the study area for these species is unlikely to significantly affect the life cycle of these species, given the area of available habitat off site, particularly in the land adjacent to the west. Furthermore, the habitat within the site is already degraded and disturbed in an urban environment, with 0.8 ha to be retained on site. While three hollow-bearing trees are proposed to be removed, three are proposed for retention, which will continue to provide roosting habitat for these species.
(c) (i) Habitat Removal	The proposal is unlikely to remove any habitat that is vital to these species, and would remove 2.18 ha of predominantly exotic grassland. Habitat is available adjacent to the site to the west, and 0.8 ha is to be retained within the study area.
(c) (ii) Habitat Fragmentation	The native vegetation within the study area is already highly fragmented, and occurs as an isolated island surrounded by exotic grassland. While removal of 0.16 ha of the native vegetation would result in greater fragmentation, the effects of this are unlikely to be significant upon these highly mobile species, especially considering the available habitat adjacent to the site to the west.
(c) (iii) Habitat importance	No important habitat would be removed as part of the proposed activity, largely because the vegetation to be removed is already degraded and disturbed. There is also 0.8 ha of habitat to be retained within the study area, including three hollow-bearing trees, and habitat available to the west.
(e) KTP	<p>The proposal will result in the following key threatening processes:</p> <ul style="list-style-type: none"> • Clearing of native vegetation; • Loss of hollow-bearing trees; and • Removal of dead wood and dead trees. <p>The proposal may result in the following key threatening processes:</p> <ul style="list-style-type: none"> • Anthropogenic climate change; • Invasion of native plant communities by exotic perennial grasses; • Infection of native plants by <i>Phytophthora cinamomi</i>; and • Introduction and establishment of exotic rust fungi of the order <i>Pucciniales</i> pathogenic on plants of the order <i>Myrtaceae</i>.
Conclusion	The proposal would remove 2.18 ha of foraging and roosting habitat for these species. However, the habitat to be removed is predominantly exotic grassland, and the native vegetation to be removed is degraded and disturbed. A total of 0.8 ha of foraging and roosting habitat will be retained on site, and habitat exists to the west of the study area. Therefore, the proposed activity is unlikely to significantly impact upon these threatened bat species such that they would become extinct in the locality.

APPENDIX 6. STAFF CONTRIBUTIONS

The following staff were involved in the preparation of this report.

Name	Qualification	Title/Experience	Contribution
Philippa Fagan	BBiod.&Cons. MEnv. & Bus. Mgmt	Ecologist (Botanist)	Field surveys and report writing
Samara Schulz	BEnvSc & Mgt (Hons)	Senior Ecologist (Botanist)	Report review (Flora)
Kristy Peters	BParkMgt/BSc (Hons Ecology)	Senior Ecologist	Report Review
Nigel Fisher	BSc (Hons) PhD	Senior Soil Microecologist	Fauna Surveys
Gayle Joyce	BSc Forestry (Hons)	GIS Specialist	Figure Preparation

APPENDIX 7. LICENSING

Kleinfelder employees involved in the current study are licensed or approved under the *National Parks and Wildlife Act 1974* (License Number: SL100730, Expiry: 31 March 2019) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.