181 FOREST WAY, BELROSE

Flora and Fauna Assessment

For:

Huntingdon Nursing Home

September 2018

Final

PO Box 2474
Carlingford Court 2118

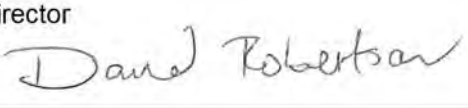
Report No. 16222RP3

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Version	Date Issued	Amended by	Details
1	11/09/2018	VO/TP	Draft
2	13/09/2018	VO	Final

Approved by: David Robertson

Position: Director

Signed: 

Date: *13 September, 2018*

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Glossary of Terms

AOBV	Area of outstanding biodiversity value
BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Regulation	NSW *Biodiversity Conservation Regulation 2017*
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
DoEE	Commonwealth Department of the Environment and Energy
DP&E	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EIA	Ecological Impact Assessment
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
GPS	Global Positioning System
LGA	Local Government Area
Locality	The area within a 10 km radius of the centre of the study area
MNES	'Matters of National Environmental Significance' that are listed under the EPBC Act
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
the Proposed Development	The proposed Aged Care Facility development, located at 181 Forest Way, Belrose
Study area	The area subject to the ecological investigation within this report, comprising Lot 3 DP805710 and the adjoining unformed road easment to the north, as shown in **Figure 1.1**
Subject land	Lot 3 DP805710, within which development is proposed
Subject site	The area directly impacted by the Proposed Development as shown in **Figure 1.1**
TEC	'Threatened Ecological Community' that are listed under the BC Act or EPBC Act
VIS	Vegetation Information System

Executive Summary

S1 Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Huntingdon Nursing Home C/- Trinity Management Services Pty Ltd, on behalf of Morrison Design Partnership Architects, to conduct a Flora and Fauna Assessment (FFA) to support a Development Application (DA) for a proposed development at 181 Forest Way, Belrose (Lot 3 DP805710) ('the subject land').

The proposed development involves the construction and operation of an aged care facility and associated services, within the western portion of the subject land (referred to as the 'subject site').

The purpose of this FFA is to evaluate the ecological impacts of the proposed development, specifically impacts on threatened flora, fauna or ecological communities listed under the NSW Biodiversity Conservation *Act 2016* (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) known to occur within the locality of the subject land. This report also documents the reasons why the Biodiversity Offsets Scheme under the BC Act does not apply to the proposed development.

S2 Background

The subject land is located within the Northern Beaches Council (formerly Warringah) Local Government Area (LGA). It is approximately 2.12 ha in area and contains an existing residential dwelling in the west. The majority of the vegetation has been cleared previously, so much of the subject land comprises open cleared ground.

A DA was submitted to Warringah Council (now part of Northern Beaches Council) in 2017 for development of the subject site into a 140 bed residential aged care facility. Council provided feedback, and requested additional information on bushfire protection, traffic and access management, and biodiversity. In response to Council feedback on the previous DA, the access to Forest Way has been modified to be via the south of the subject land. A slip lane is also proposed for construction on Forest Way, within land along the western boundary (shown on **Figure 1.2**) that will be acquired by the NSW Roads and Maritime Services (RMS).

The current DA is for the development of a 138 bed residential aged care facility, and all associated ancillary works. The building footprint will be confined to the elevated building platform towards Forest Way.

S3 Methodology

Database analysis, vegetation/flora surveys, fauna habitat surveys, and incidental fauna observations were undertaken in November 2016. Flora surveys involved recording the presence of species in random meanders and targeted threatened flora surveys. All vascular plants were recorded or collected and were identified to species level where possible. Fauna surveys included a habitat assessment and any incidental observations of birds and other vertebrates.

An additional targeted survey for *Grevillea caleyi* (Caley's Grevillea) was undertaken on 5 October 2017, adjacent to the northern boundary of the subject land within the unformed road reserve, within the area defined as the 'study area'. This targeted survey was required by Council as the species is known to occur in this area. *Grevillea caleyi* is listed as Critically Endangered under the BC Act and as Endangered under the EPBC Act. *Tetratheca glandulosa*, listed as Vulnerable under the BC Act but not listed under the EPBC Act was also targeted during these surveys as it has previously been recorded within the road reserve.

S4 Results

Approximately 1.42 ha of native vegetation, and 0.57 ha of exotic grassland, occur within the subject land. This includes 0.08 ha of Duffys Forest Ecological Community (DFEC). DFEC is listed as an Endangered Ecological Community (EEC) under the BC Act but is not listed under the EPBC Act. The majority of the subject land has already been largely cleared of native vegetation.

Over 200 flora species have been recorded from the subject land during surveys. Species present within the subject land consist of a mix of native species (60%) and exotic/non-endemic native planted species (40%). One individual of *Syzygium paniculatum* (Magenta Lily Pilly) was recorded in the north west of the subject land. This species is listed as Endangered under the BC Act and Vulnerable under the EPBC Act, but is commonly planted in gardens in the Sydney region. In addition, two individuals of *Eucalyptus scoparia* were recorded in the north west of the subject land. This species is listed as Endangered under the BC Act and Vulnerable under the EPBC Act and is also commonly planted in Sydney gardens. No naturally occurring threatened flora species were recorded within the subject land.

Four adult, one juvenile (> 50cm tall) and seven young *Grevillea caleyi* were recorded in the road reserve along the frontage to Forest Way. Some of these had previously been recorded by Northern Beaches Council. *Tetratheca glandulosa* was not recorded during the surveys, although suitable habitat is present.

From the desktop assessment and subsequent subject land inspection, seven threatened fauna species are considered as having potential to occur within the subject land. An additional two migratory species listed under the EPBC Act have the potential to forage aerially above the subject land. The known and potentially occurring fauna species are highly mobile and are expected to move between areas of remaining habitat within the immediate vicinity of the subject land and the surrounding area.

S5 Impact Assessment

The majority of the subject land has previously been cleared of native vegetation. The proposed development will result in the clearance of 0.32 ha out of a total of 1.42 ha of native vegetation. This includes; 0.05 ha of Coastal Sandstone Heath Malley in various states of regeneration, 0.001 ha of Duffy's Forest EEC, and 0.27 ha of Urban Native and Exotics. Exotic grassland (totalling 0.57 ha) will also be removed or rehabilitated with the adjoining native vegetation communities. Additionally, some canopy trees within the retained area of Duffys Forest may need to be removed for the purpose of bushfire protection.

No naturally occurring threatened flora species were detected on the subject land or are considered likely to occur. One individual of *Syzygium paniculatum* (Magenta Lilly Pilly) and two individuals of *Eucalyptus scoparia* were recorded in the north west of the subject land. However, these threatened species are not endemic to the Sydney region.

One threatened flora species; *Grevillea caleyi*, has been recorded in the study area, to the north of the subject land. There is potential habitat for this species on the subject land, in the area of DFEC present in the north of the subject land. However, the known habitat in the study area will not be removed, and potential indirect impacts are considered to unlikely due to the provision of an APZ at the northern boundary, which will provide a buffer to the development. The potential habitat present on the subject land will be modified as part of the APZ, but will be retained with an intact understorey. Accordingly, the proposed development is considered unlikely to have a significant impact upon this species.

Some potential foraging habitat for threatened fauna species will be removed for the proposed development; however none of the potentially occurring threatened fauna species are likely to be dependent on habitat within the subject land for their survival. The majority of suitable foraging habitat has already been cleared throughout the majority of the subject land. The species are highly mobile species that access resources from a wide area. A Test of Significance has determined that the proposed development is unlikely to have a significant impact on these threatened fauna species.

S6 Mitigation Measures

A number of mitigation measures are recommended for the proposed project. The mitigation measures recommended to be implemented included:

- Vegetation protection;
- Erosion, sedimentation and pollution control;
- Pre-clearing and clearing surveys;
- Weed control measures; and
- Re-vegetation (under a Biodiversity Management Plan)

S7 Conclusion

Past and current use of the subject land has entailed clearing and modification of the majority of the pre-existing native vegetation. Despite the impacts of previous disturbance and its location within a fragmented landscape, the vegetation proposed to be cleared provides suitable, albeit marginal habitat for some threatened flora and fauna species.

The proposed development footprint will require the removal of up to 0.001 ha of Duffys Forest EEC (Regrowing Understorey), 0.05 ha of Coastal Sandstone Heath-Mallee in various states of regeneration, and 0.27 ha of Urban Native. Exotic grassland (totalling 0.57 ha) will also be removed or rehabilitated with the adjoining native vegetation communities. The retained vegetation on the subject land will be managed as an APZ.

The development layout has been modified to ensure that direct and indirect impacts on the DFEC, and the nearby population of *Grevillea caleyi* located in the unformed road easement to the north, are avoided. This includes the modified site access driveway, which has been amended since the previous DA, and is now located to the south of the proposed aged care facility, and a slip lane from Forest Way.

Due to the small area of vegetation to be removed, and the poor quality of the habitat, no significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed development. Therefore, the preparation of a BDAR is not warranted. A referral to the Commonwealth Department of the Environment and Energy, under the EPBC Act is also not required.

Chapter 1

Introduction

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by Huntingdon Nursing Home C/- Trinity Management Services Pty Ltd, on behalf of Morrison Design Partnership Architects, to conduct a Flora and Fauna Assessment (FFA) to support a proposed Development Application (DA) for 181 Forest Way, Belrose (Lot 3 DP805710) ('the subject land').

The proposed development involves the construction and operation of an aged care facility and associated services, within the western portion of the subject land (referred to as the 'subject site'), as shown in **Figure 1.1**.

1.1 Purpose

The purpose of this report is to describe the current biodiversity values of the subject land and to assess the potential impacts of the proposed development on flora and fauna, particularly threatened species, populations and communities that are listed under the New South Wales (NSW*) Biodiversity Conservation Act 2016 (BC Act)* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The main objective of this report is to determine whether the proposed development is likely to significantly affect threatened biodiversity values and to outline the measures proposed to mitigate those impacts.

Specifically, the objectives of this FFA are to:

- Document the reasons why the Biodiversity Offsets Scheme under the BC Act applies does not apply to the proposed development;
- Describe and map vegetation communities of the study area, identifying threatened ecological communities (TECs) listed under the BC Act and/or the EPBC Act;
- Identify and map the location of threatened flora and fauna species present;
- Assess the likelihood as to whether threatened flora and fauna species could occur within the area of impact, and any additional areas with potential to be impacted (referred to as the 'study area', as shown in **Figure 1.1**);
- Describe the types and extent of potential impacts arising from the proposed development; and

Where relevant, recommend mitigation measures to reduce the impacts of the proposed development on biodiversity values.

1.2 Background

1.2.1 Site Description

The subject land comprises Lot 3 DP805710, and is located at 181 Forest Way, Belrose, in the Northern Beaches Council Local Government Area (LGA) (**Figure 1.1**). The subject land is unzoned under the *Warringah Local Environmental Plan 2011*.. The subject land is bound by Forest Way to the west and residential dwellings to the north, east and south. It is approximately 2.12 ha in area and contains an existing residential dwelling in the west. The majority of the vegetation has been cleared previously so that the subject land comprises mostly open cleared ground. The topography of the subject land varies, and the land slopes down towards the east.

1.2.2 Previous Development Application

A development application was submitted to Warringah Council (now part of Northern Beaches Council) in 2017 for development of the subject site for a 140 bed residential aged care facility. Council provided feedback, and requested additional information on bushfire protection, traffic and access management, and biodiversity. Supplementary surveys were undertaken in response to Councils request for additional assessment of impacts to threatened flora known to occur in an unformed road reserve to the north of the subject land. Following consultation with Council, the development layout was modified, to allow access from the south of the subject land, and avoid use of the road reserve to the north. The previous DA was withdrawn, on advice from Council.

1.2.3 Description of the Proposed Development

The subject land is proposed to be developed into a 138 bed residential aged care facility. The building footprint will be confined to the elevated building platform towards Forest Way (**Figure 1.2**). In response to Council feedback on the previous DA, the access to Forest Way has been modified to be via the south of the subject land. A slip lane is also proposed for construction on Forest Way, with land along the western boundary (shown on **Figure 1.2**) to be acquired by RMS.

The subject land will retain a large area of undeveloped land to the north and east, which will be managed as an Asset Protection Zone (APZ) (Travers Bushfire & Ecology 2018). The APZ has been divided into an Inner Protection Zone (IPA) and Outer Protection Zone (OPA), as shown in Schedule 1, Bushfire Protection Measures (Travers Bushfire and Ecology, 2018). A portion of the APZ will be landscaped, as per the Landscape Management Plan (Stuart Noble Associates 2018), while the remainder of the subject land will be managed and restored as retained bushland, according to a Biodiversity Management Plan (Cumberland Ecology 2018) that has been prepared for the project.

1.3 Relevant Legislation

1.3.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on Matters of National Environmental Significance (MNES) (including nationally threatened ecological communities and species, and listed migratory species) must be referred to the Commonwealth Minister for the Environment. The purpose of the referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is considered likely to have a significant impact on MNES, it is declared a "controlled action" and Commonwealth approval is required.

1.3.2 NSW Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act is the overarching planning legislation in NSW that provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants.

The proponent is seeking development consent under Part 4 of the EP&A Act.

1.3.3 NSW Biodiversity Conservation Act 2016 (BC Act)

The BC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act is supported by a number of regulations, including the *Biodiversity Conservation Regulation 2017* (BC Regulation).

The BC Act requires consideration of whether a development or an activity is likely to significantly affect threatened species. For Part 4 local developments, projects that significantly affect threatened species trigger the Biodiversity Offsets Scheme (BOS). The BOS is intended to simplify biodiversity assessment and improve biodiversity outcomes by creating consistent assessment requirements to measure the likely biodiversity loss of development proposals and gains in biodiversity value achieved at offset sites through active management. The BOS requires an assessment following the Biodiversity Assessment Methodology (BAM) by an accredited BAM assessor and the preparation of a Biodiversity Development Assessment Report.

1.4 Assessment of Entry into the Biodiversity Offsets Scheme

To determine the type of assessment required for the Project it is necessary to determine whether the Project triggers the BOS. For the Project to trigger the BOS, it would need to be considered as likely to significantly affect threatened species, which could occur as follows:

- It is likely to significantly affect threatened species or ecological communities, or their habitats, according to the test of significance in Section 7.3 of the BC Act; or
- It exceeds the biodiversity offsets scheme threshold; or
- It is carried out in a declared area of outstanding biodiversity value (AOBV).

These three criteria are assessed in detail below. The results indicated that the Project does not trigger the BOS and therefore a general FFA is provided in this report.

1.4.1 Test of Significance

A test of significance in accordance with Section 7.3 of the BC Act was undertaken for all threatened communities and species known, or considered likely, to occur within the study area (see **Appendix D**). None of these communities or species are considered to be significantly affected by the proposal and therefore the BOS is not triggered by this mechanism.

1.4.2 Biodiversity Offsets Scheme Threshold

A development can exceed the BOS threshold if it is or involves:

- The clearing of native vegetation of an area above a prescribed threshold based on the minimum lot size; or
- The clearing of native vegetation, or other prescribed action, on land included on the Biodiversity Values Map.

An assessment of these two components is provided below. The Project does not exceed either of these thresholds and therefore the BOS is not triggered by this mechanism.

i. Area Threshold

The proposed development occurs on Lot 3 DP805710, which is mapped as a 'deferred matter' (unzoned) under the *Warringah Local Environmental Plan 2011*. No minimum lot size is specified for unzoned and therefore the minimum lot size is taken to be actual size of the lot in accordance with Clause 7.2(2)(b) of the BC Act, which is approximately 2.12 ha. Based on the actual lot size of approximately 2 ha, the area threshold would be exceeded if the development involved the clearing of 0.5 ha or more of native vegetation. As the proposed development only involves the clearing of 0.32 ha of native vegetation, the BOS is not triggered by this mechanism.

ii. Biodiversity Values Map

The subject site, which is the location of the development footprint and area subject to clearing, does not occur on land mapped on the Biodiversity Values Map (see **Figure 1.3**). Therefore, the BOS is not triggered by this mechanism.

1.4.3 Declared Area of Outstanding Biodiversity Value

The BC Act currently lists the following AOBVs:

- Gould's Petrel habitat;
- Little Penguin population in Sydney's North Harbour habitat;
- Mitchell's Rainforest Snail in Stotts Island Nature Reserve; and
- Wollemi Pine habitat.

The proposed development is not located within the above AOBVs and therefore the BOS is not triggered by this mechanism.

Legend

- Subject Site
- Subject Land
- Study Area

Image Source:
Image © NearMap 2018
Dated: 23/7/2018

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 m

I:\...\16222\Figures\RP3\20180830\Figure 1.1. Location_subject site_subject land_study area

Figure 1.1. Location of the subject site, subject land and study area

PROPOSED RESIDENTIAL AGED CARE FACILITY

LOWER GROUND FLOOR (LG) - RL163.10
GROUND FLOOR (GF) - RL167.20
FIRST FLOOR (FF) - RL170.50
SECOND FLOOR (SF) - RL173.80

DEVELOPMENT APPLICATION

APPLICANT:
CHRIROSEPH PTY LTD
PO Box 267
St Leonards NSW 2065

ARCHITECT:
Morrison Design Partnership Pty Ltd
Suite 302 / 49 Chandos St
St Leonards NSW 2065
PH: 02 9906 3566

PROJECT:
BELROSE MANOR
RESIDENTIAL AGED CARE FACILITY
181 FOREST WAY
BELROSE NSW 2085

DRAWING:
SITE PLAN

PROJECT NO.: 2951
REVISION NO.: A
DRAWING NO.: DA050
SCALE: 1:200@A1
DATE: APRIL 2017
PROJECT DIRECTOR: MARKAM RALPH

Morrison Design Partnership

I:\...\16222\Figures\RP3\20180830\Figure 1.3. Development Layout

Figure 1.2. Development Layout

Image Source: Morrison Design Partnership Pty Ltd 2017

Legend

- Subject Site
- Subject Land
- Study Area
- Biodiversity Values Map

Image Source:
Image © NearMap 2018
Dated: 23/7/2018

Coordinate System: MGA Zone 56 (GDA 94)

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I:\...\16222\Figures\RP3\20180830\Figure 1.2. BVM_StudyArea

Figure 1.3. Biodiversity Values Mapping of the study area (OEH, 2018)

Chapter 2

Methods

2.1 Database Analysis and Literature Review

A number of databases were utilised during the preparation of this FFA. Key databases reviewed for this FFA include:

- Vegetation classification:
  - Vegetation Information System (VIS) Classification Database
- Species records/occurrences:
  - Office of Environment and Heritage (OEH) BioNet Atlas (OEH 2018);
  - Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE 2018);
  - Department of Primary Industries Freshwater Threatened Species Distribution Maps (DPI 2018);
- Species profiles:
  - OEH Threatened Species Profile Database; and
  - DoEE Species Profile and Threat Database.

Database analysis was conducted for the locality using both the OEH Bionet Atlas (OEH 2018) and the DoEE) Protected Matters Search Tool (DoEE 2018). The locality is defined as the area within a 5 km radius of the subject land. The Atlas of NSW Wildlife Database search was used to generate records of threatened flora and fauna species listed under the BC Act within the locality of the subject land. The Protected Matters Search Tool generated a list of Matters of National Environmental Significance listed under the EPBC Act potentially occurring within the locality of the subject land. Marine birds (albatross, petrel, prion and tern), marine mammals, turtles and fish species were excluded for the purpose of this report as the subject land is not located in vicinity to the sea. The lists generated from these databases were reviewed against available knowledge of the subject land, in conjunction with the abundance, distribution and age of records, to ascertain the likelihood of occurrence of threatened species within the subject land (**Appendix A**).

2.2 Flora Survey

Flora surveys were undertaken within the subject land by Cumberland Ecology on 21 November 2016 by a botanist and ecologist over a five hour period. Surveys included vegetation mapping, random meander survey and targeted threatened flora searches. Further details of each of the survey methods are provided below.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2016).

2.2.1 Vegetation Mapping

Previous broad-scale mapping conducted by the Sydney Metropolitan Catchment Management Authority (SMCMA) Vegetation Mapping project (OEH 2013) was utilised to determine potential vegetation communities likely to occur within the subject land. Cumberland Ecology conducted additional vegetation surveys to revise and update the vegetation mapping prepared by OEH. The vegetation within the subject land was then ground-truthed to examine and verify the mapping of the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the OEH mapping, records were made of proposed new boundaries using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs.

The resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the subject land.

2.2.2 Random Meander Surveys

Random meander surveys were undertaken to obtain information on species composition and community structure for vegetation communities within the subject land. Random meander surveys were undertaken within all vegetation communities (see **Figure 2.1** for locations).

2.2.3 Targeted Threatened Flora Surveys

Targeted threatened flora searches via random meanders were undertaken within suitable habitat of threatened flora species known from the locality. The locations of threatened flora specimens observed during surveys were recorded using a hand-held GPS.

An additional targeted survey was undertaken for or *Grevillea caleyi* (Caley's Grevillea) and *Tetratheca glandulosa* on 5 October 2017 in the study area, adjacent to the northern boundary within the unformed road reserve.

2.3 Fauna Survey

Fauna surveys were undertaken within the subject land by Cumberland Ecology on 21 November 2016. Surveys included a fauna habitat assessment and incidental observations. Further details of each of the survey methods are provided below.

2.3.1 Habitat Assessments

A fauna habitat assessment was undertaken on 21 November 2016 by an ecologist over a five hour period. The assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

2.3.2 Incidental Observations

Any incidental fauna species that were observed, heard calling, or otherwise detected on the basis of tracks or signs, were recorded and listed in the total species list for the subject land.

2.4 Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The surveys by Cumberland Ecology added to the existing database and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur within the subject land. The data obtained from database assessment and surveys of the subject land furnished an appropriate level of information to support this assessment.

The weather conditions at the time of the flora surveys were generally favourable for plant growth and production of features required for identification of most species. Shrubs, grasses, herbs and creepers were readily identifiable in most instances. It is expected that not all flora species present would have been recorded during surveys. Despite this, it is considered that sufficient information has been collected to assess issues including conservation significance of the flora, condition and viability of bushland and likely impact on native vegetation. An assessment of the likelihood of occurrence of threatened flora species recorded within the locality of the subject land in the database searches was undertaken to supplement the flora survey.

Limited targeted fauna surveys were undertaken for this assessment, which relied on database analysis and fauna habitat assessment. In general, opportunistic observations of fauna provide a “snapshot” of some of the fauna present on a site that were active during time of the surveys. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all vertebrate fauna species occurring within the study area. Therefore not all fauna utilising the subject land are likely to have been recorded during surveys. An assessment of the likelihood of occurrence of

threatened and migratory fauna species listed for the locality in the database searches was undertaken to supplement the fauna surveys. The combination of these techniques is considered appropriate for assessing the habitat values of the site for threatened fauna within the subject land.

The area calculations for the proposed development layout are from indicative boundaries only. These were digitised from a PDF image as no spatial files (.dwg or .dxf with spatial coordinates) were provided. In addition, the area calculation for DFEC only estimates the current proposed development impact. As such, Cumberland Ecology cannot estimate the additional trees that require clearing and/or trimming for the purpose of APZs.

Legend

- Subject Site
- Subject Land
- Study Area
- Random Meander Survey

Image Source:
Image © NearMap 2018
Dated: 23/7/2018

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

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I:\...\16222\Figures\RP3\20180830\Figure 2.1. Random meander survey locations

Figure 2.1. Random meander survey locations

Chapter 3

Results

3.1 Vegetation Communities

Previous broad-scale mapping conducted by the Sydney Metropolitan Catchment Management Authority (SMCMA) Vegetation Mapping project (OEH 2013) indicates that Weeds and Exotics, Coastal Sandstone Heath-Mallee, Coastal Upland Damp Heath Swamp, Sydney North Exposed Sandstone Woodland and Coastal Sandstone Gully Forest occur on the subject land. Coastal Upland Swamp is listed as an Endangered Ecological Community (EEC) under the BC Act and the EPBC Act.

Surveys by Cumberland Ecology for this assessment refined the existing vegetation mapping of the subject land and confirmed the occurrence of the following vegetation communities:

- Duffys Forest Ecological Community (Regrowing Understorey);
- Coastal Sandstone Heath-Mallee;
- Sydney North Exposed Sandstone Woodland;
- Coastal Sandstone Gully Forest; and
- Urban Native/Exotic vegetation.

Duffys Forest Ecological Community (DFEC) is listed as an EEC under the BC Act but is not listed under the EPBC Act. Due to former clearing that has been undertaken throughout the subject land, native communities present within the site are in various conditions and have been categorised and described both by SMCMA unit name (where applicable unit applies) and condition below.

The distribution of these communities in the study area is shown in **Figure 3.1** and the areas of each are provided in **Table 3.1** below.

Coastal Sandstone Damp Heath has been previously mapped on the site under the SMCMA (OEH 2013) mapping. Areas of the site may have once been consistent with this community, but occurrence of the community on the site is not currently discernible due to clearing and it has not been mapped as currently occurring (See **Section 3.1.6**).

Table 3.1 Vegetation Communities and Areas within the Subject land

Vegetation Community	Area (ha)	
	Subject land	Development Footprint
Duffys Forest EEC (Regrowing Understorey)	0.08	0.001
Coastal Sandstone Gully Forest (Exotic Dominated Ground Layer)	0.11	0
Sydney North Exposed Sandstone Woodland (Cleared)	0.06	0
Coastal Sandstone Heath-Mallee (Exotic Dominated Ground Layer)	0.07	0.001
Coastal Sandstone Heath-Mallee (Regrowing Understorey)	0.17	0.004
Coastal Sandstone Heath-Mallee (Cleared Canopy - Regrowing)	0.22	0.04
Coastal Sandstone Heath-Mallee (Cleared)	0.34	0
Urban Native and Exotic	0.38	0.27
Exotic Grassland - Mown Lawn	0.57	0.45
Total	**1.99**	**0.77**

Descriptions of each of the vegetation communities are provided below.

3.1.1 Duffys Forest Ecological Community (Regrowing Understorey)

BC Act Status: Endangered Ecological Community

EPBC Act Status: Not listed

Duffys Forest Ecological Community (DFEC) covers 0.08 ha to the north of the subject land. It is an open forest with some scattered shrubs (**Photograph 3.1**), though much of the shrub layer and ground layer are in a state of regrowth following former clearing. The community is situated on a ridgetop, at the highest point within the subject land.

The characteristic canopy species is *Eucalyptus sieberi* (Silvertop Ash), with other native trees being *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus globoidea* (White Stringybark). Characteristic shrubs for DFEC present within the subject land are *Phyllota phylicoides* (Heath Phyllota), *Acacia ulicifolia* (Prickly Moses), *Leptospermum trinervium* (Flaky-barked Tea-tree), *Persoonia levis* (Broad-leaved Geebung) and *Lambertia formosa* (Mountain Devil). Many of the shrub species within the community are present either as juveniles regrowing from seed, or as coppiced regrowth from cut stumps.

The ground layer includes indigenous species such as *Pteridium esculentum* (Common Bracken), *Entolasia stricta* (Wiry Panic), *Lepidosperma laterale*, *Cyathochaeta diandra*, *Patersonia sericea* (Silky Purple-flag), *Lomandra glauca* (Pale Mat-rush), *Xanthorrhoea media* and *Lomandra obliqua*. Some exotic species are present including *Cirsium vulgare*

(Spear Thistle), *Plantago lanceolata* (Lamb's Tongues), *Ehrharta erecta* (Panic Veldtgrass) and *Paspalum dilatatum* (Paspalum).

A full flora species list is provided in **Appendix B**.

The vegetation within the north of the subject land is considered to conform to the DFEC due to a combination of the canopy, understorey and groundcover species, elevation and soil type. The elevation of the subject land where DFEC occurs is 175 m above sea level (asl) which is consistent with the Duffys Forest community (which occurs between 100 – 300m asl). The community on the subject land is also of an open forest to woodland structure, typical of Duffys Forest and the natural soil of the subject land contains a sandstone influence with some ironstone nodules present.

Photograph 3.1 Duffys Forest Ecological Community

3.1.2 Coastal Sandstone Heath-Mallee (Regrowing Understorey)

BC Act Status: Not listed

EPBC Act Status: Not listed

Coastal Sandstone Heath-Mallee with a regrowing understorey occurs in the north of the subject land with an area of 0.17 ha below the ridgeline on south facing slopes. Generally this area is quite open with scattered canopy trees and a sparse to no shrub layer in some areas (**Photograph 3.2**). Canopy species include *Corymbia gummifera* (Red Bloodwood), *Eucalyptus globoidea* (White Stringybark), *Allocasuarina distyla* (Scrub She-oak),

Allocasuarina littoralis (Black She-oak) and *Eucalyptus haemastoma* (Scribbly Gum). Canopy species are stunted due to shallow soils.

A relative diversity of native shrub species are present, though the majority of individuals of species are less than 30 cm in height and are regrowing following past clearing.. Native shrubs include *Platysace linearifolia*, *Woollsia pungens, Epacris crassifolia*, *Pultenaea stipularis* (Handsome Bush-pea) and *Acacia longifolia* subsp. *longifolia* (Sydney Golden Wattle). Exotic shrubs present include *Senna pendula* and *Solanum mauritianum* (Wild Tobacco Bush).

The groundlayer of this community in the study area is comprised predominately of native species including *Xanthosia pilosa* (Woolly Xanthosia), *Actinotus minor* (Lesser Flannel Flower), *Actinotus helianthi* (Flannel Flower), *Pteridium esculentum* (Common Bracken), *Drosera spatulata*, *Caustis pentandra* (Thick Twist Rush) and *Lomandra glauca* (Pale Mat-rush). Exotic species present include *Bidens pilosa* (Cobblers Pegs), *Cirsium vulgare* (Spear Thistle), *Trachelospermum jasminoides* (Star Jasmine) and *Paspalum dilatatum* (Paspalum). The ground layer is also regrowing following past clearing.

Photograph 3.2 Coastal Sandstone Heath-Mallee (Regrowing Understorey)

3.1.3 Coastal Sandstone Heath-Mallee (Cleared)

BC Act Status: Not listed

EPBC Act Status: Not listed

Areas mapped as Coastal Sandstone Heath-Mallee (Cleared) are likely to have supported the Coastal Sandstone Heath-Mallee community prior to clearing, based on the presence of characteristic remnant and regrowth species. The community in this condition covers 0.34 ha of the subject land. This area has been nearly entirely cleared and at present these areas consist of very scattered remnant canopy trees, of stunted *Corymbia gummifera* (Red Bloodwood), *Eucalyptus haemastoma* (Red Bloodwood), and *Allocasuarina distyla* (Scrub She-oak) (**Photograph 3.3**). Native understorey and ground layer regrowth is very sparse and the majority of shrubs present are only juveniles. Shrub species include *Leptospermum squarrosum* (Peach Blossom Tea-tree), *Banksia ericifolia* (Heath Banksia), *Viminaria juncea* (Golden Spray), and *Grevillea sericea* (Pink Spider-flower). Ground layer species include the grasses *Anisopogon avenaceus* (Oat Speargrass) and *Entolasia stricta* (Wiry Panic), forbs *Actinotus minor* (Lesser Flannel Flower), and *Gonocarpus teucrioides* (Raspwort), and graminoids *Lomandra obliqua* and *Schoenus apogon* (Common Bog-rush).

Exotic species present include the shrub *Lantana camara* (present as a seedling) the forbs Lotus *uliginosus* (Birds Foot-trefoil) and *Conyza sumatrensis* (Tall Fleabane), and the grasses *Andropogon virginicus* (Whiskey Grass) and *Paspalum dilatatum.*

Photograph 3.3 Coastal Sandstone Mallee-Heath (Cleared)

3.1.4 Coastal Sandstone Heath-Mallee (Cleared Canopy – Regrowing)

BC Act Status: Not listed

EPBC Act Status: Not listed

Areas mapped as Coastal Sandstone Mallee-Heath (Cleared Canopy – Regrowing) are likely to have comprised Coastal Sandstone Mallee-Heath prior to clearing (**Photograph 3.4**). These areas have denser regrowth of native shrub and ground layer species than the Coastal Sandstone Mallee-Heath (Cleared) community, and have a nearly complete lack of retained individuals of canopy species. This community condition covers 0.22 ha of the subject land. Shrubs are present only as regrowth juveniles. Shrub species present include *Pimelea linifolia* (Slender Rice Flower), *Angophora hispida* (Dwarf Apple), and *Acacia myrtifolia* (Red-stemmed Wattle). Ground layer species include *Dianella caerulea* var. *producta* (Blue Flax-lily), *Xanthosia tridentata* (Rock Xanthosia), *Scaevola ramosissima* (Snake Flower), *Goodenia paniculata* (Branched Goodenia), and the grasses *Entolasia stricta* and *Panicum simile* (Two-colour Panic).

Some exotic species such as the grass *Paspalum dilatatum* are present in these areas however native species are dominant.

Photograph 3.4 Coastal Sandstone Mallee-Heath (Cleared Canopy – Regrowing) in the west of the subject land

3.1.5 Coastal Sandstone Heath-Mallee (Cleared Canopy – Exotic Dominated Ground Layer)

BC Act Status: Not listed

EPBC Act Status: Not listed

These areas are similar in native regrowth species composition to the Coastal Sandstone Mallee-Heath (Cleared Canopy – Regrowing) community, however regrowth of native plants is sparser, likely due to out-competition for resources from exotic herbaceous species. The community in this condition occurs on an east-facing sandstone slope, and covers approximately 0.07 ha of the subject land. The ground layer in this area is dominated by exotic species including juvenile exotic shrubs such as *Senna pendula* (Winter Cassia) and *Solanum mauritianum* (Wild Tobacco Bush), exotic forbs such as *Ageratina adenophora* (Crofton Weed), *Solanum sisymbriifolium, Cirsium vulgare* (Spear Thistle), and *Phytolacca octandra* (Inkweed), and exotic grasses and sedges including *Cyperus eragrostis* (Umbrella Sedge), *Andropogon virginicus* (Whiskey Grass), *Cortaderia selloana* (Pampas Grass), and *Axonopus fissifolius* (Carpet Grass) (**Photograph 3.5**).

Photograph 3.5 Coastal Sandstone Mallee-Heath (Cleared Canopy – Exotic Dominated Ground Layer)

3.1.6 Coastal Upland Damp Heath Swamp (Cleared)

BC Act Status: Endangered Ecological Community

EPBC Act Status: Endangered Ecological Community

There is some evidence that part of the cleared vegetation in the centre of the subject land could have comprised of the EEC Coastal Upland Damp Heath Swamp. Three characteristic species of this community are present within this area, *Gahnia sieberiana* (Red-fruit Saw-sedge) and *Empodisma minus* (Spreading Rope-rush) and *Schoenus brevifolius* (Zig-zag Bog-rush). Other native swamp species are also present such as *Typha orientalis* (Broadleaf

Cumbungi) (**Photograph 3.6**). This community has not been mapped due to difficulties in defining its presence due to the lack of areas of characteristic shrub species. If the community was present on site formerly it is likely to have occurred in areas of impeded drainage within the area mapped in **Figure 3.1** as Coastal Sandstone Heath-Mallee (Cleared), and potentially along an ephemeral creek line in the west of the site.

Photograph 3.6 Cleared Potential Coastal Upland Damp Heath Swamp

3.1.7 Sydney North Exposed Sandstone Woodland (Cleared)

BC Act Status: Not listed

EPBC Act Status: Not listed

The presence of this community is indicated only by taller retained trees of *Corymbia gummifera* compared to trees located in the Coastal Sandstone Heath-Mallee (Cleared). The community covers 0.06 ha of the study area.

3.1.8 Coastal Sandstone Gully Forest (Exotic Dominated Ground Layer)

BC Act Status: Not listed

EPBC Act Status: Not listed

This community occurs in the south-east corner of the subject land (0.11 ha) in the lowest elevation. It consists of a canopy of one large *Eucalyptus piperita* (Sydney Peppermint), and several smaller, younger trees of *Eucalyptus piperita*, *Eucalyptus sieberi*, *Angophora*

costata, and *Glochidion ferdinandi* (Cheese Tree). The shrub and ground layer have been cleared as with elsewhere on the subject land, and regrowing species of shrubs include *Leptospermum polygalifolium* (Tantoon), *Hakea propinqua*, *Persoonia pinifolia* (Pine-leaved Geebung), and *Bauera rubioides* (Dog Rose) (**Photograph 3.7**).

The ground layer ranges from cleared with sparse native regrowth to dominated by exotic weed species. Native species present include *Xanthosia tridentata*, *Dampiera stricta, Lepidosperma laterale*, and the grasses *Lachnagrostis filiformis* (Blown Grass), and *Imperata cylindrica* (Blady Grass).

Exotic species in the ground layer include *Ageratina adenophora, Cenchrus clandestinus* (Kikuyu), *Paspalum dilatatum*, *Cyperus eragrostis*, and *Bidens pilosa*.

Photograph 3.7 Coastal Sandstone Gully Forest (Exotic Dominated Ground Layer)

3.1.9 Urban Native/Exotic vegetation

BC Act Status: Not listed

EPBC Act Status: Not listed

Planted Urban Native and Exotic Vegetation is present throughout 0.38 ha in the west of the subject land near the residential dwelling (**Photograph 3.8**). Canopy trees present include planted non-indigenous natives such as *Casuarina glauca* (Swamp Oak), *Eucalyptus globulus* subsp. *globulus*, *Eucalyptus cladocalyx* (Sugar Gum), *Lophostemon confertus* (Brush Box) and *Syzygium paniculatum* (Magenta Lilly Pilly). Some remnant native trees are

present which include *Syncarpia glomulifera* (Turpentine), *Acacia decurrens* (Black Wattle), *Pittosporum undulatum* (Native Daphne) and *Eucalyptus haemastoma* (Scribbly Gum). Many exotic trees have been planted throughout the west of the subject land such as *Liquidambar styraciflua*, *Syagrus romanzoffiana* (Cocos Palm), *Pinus radiata* (Radiata Pine), *Schinus areira* (Pepper Tree) and *Jacaranda mimosifolia* (Jacaranda).

Shrubs include exotic species *Harpephyllum caffrum* (Kaffir Plum), *Erythrina crista-galli* (Cockspur Coral Tree), *Senna pendula*, *Cotoneaster glaucophyllus* and *Ochna serrulata* (Mickey Mouse Plant). Remnant indigenous *Angophora costata* (Sydney Red Gum) and planted non-indigenous natives also occur: *Syzygium australe* (Brush Cherry) and *Tristaniopsis laurina* (Water Gum). Groundcover is predominantly exotic grasses such as *Cynodon dactylon* (Couch), *Ehrharta erecta* (Panic Veldtgrass) and *Cenchrus clandestinus* (Kikuyu Grass) maintained by mowing as a lawn.

Photograph 3.8 Urban Native/Exotic vegetation

3.2 Flora Species

3.2.1 General Species

Over 200 species have been recorded throughout the subject land during surveys. The dominant plant families encountered within the subject land are Cyperaceae, Poaceae, Fabaceae, Asteraceae and Myrtaceae. Species present within the subject land consists of a mix of native species (60%) and exotic/non-endemic native planted species (40%). A complete flora list is provided in **Appendix B**.

3.2.2 Threatened Species

i. Subject land

One individual of *Syzygium paniculatum* (Magenta Lily Pilly) was recorded in the north west of the subject land (**Figure 3.2**). This species is listed as Endangered under the BC Act and Vulnerable under the EPBC Act. It occurs in subtropical and littoral rainforest within a narrow coastal strip between Upper Lansdowne and Conjola State Forest. This species is not considered to be locally indigenous to the subject land and therefore its conservation significance is reduced. This species has been observed to be planted in gardens and roadside verges within the locality.

Two individuals of *Eucalyptus scoparia* was recorded in the north west of the subject land (**Figure 3.2**). This species is listed as Endangered under the BC Act and Vulnerable under the EPBC Act. In NSW *Eucalyptus scoparia* (Wallangarra White Gum) occurs naturally in only three locations near Tenterfield. This species is not considered to be locally indigenous to the locality and therefore its conservation significance is reduced. It is commonly planted in landscaped areas in the Sydney region.

No naturally occurring threatened flora species were recorded within the subject land or are likely to occur. Potential habitat is available for some species within the forest areas but none were sighted during the survey or have been previously recorded on the subject land. Vegetation in the subject land has been historically disturbed and largely cleared. An analysis of the likelihood of occurrence on the subject land for each threatened flora species recorded within the locality is provided in **Appendix A**. This assessment concluded that no threatened flora species are known from the locality are likely to occur within the subject land.

ii. Study Area

Four adult, one juvenile (> 50cm tall) and seven young *Grevillea caleyi* were recorded in the road reserve along the frontage to Forest Way (see **Table 3.2** and **Figure 3.2**) within the study area. Some of these had previously been recorded by Northern Beaches Council. See **Photograph 3.9 – 3.11**. Some clearing of shrubs has occurred in this area of vegetation as two of the adult *G. caleyi* are growing horizontally as they have evidently been previously pushed over.

Table 3.2 Grevillea caleyi summary

ID	Description
G1	One adult – approximately 2m high (with large spread)
G2	One adult - approximately 2m high
G3	One adult - pushed to the ground
G4	Five young
G5	One adult - pushed to the ground

Table 3.2 Grevillea caleyi summary

ID	Description
G6	Two young
G7	One juvenile - >50cm tall

Photograph 3.9 Close up view of *Grevillea caleyi* flower and seed pod

Photograph 3.10 *Grevillea caleyi* seedling

Photograph 3.11 *Grevillea caleyi* adult growing horizontally after past disturbance

Tetratheca glandulosa was not recorded during the surveys, although suitable habitat is present. The closest related species present in the road reserve is *Tetratheca thymifolia* (Thyme Pink-bells) (**Photograph 3.12**).

Photograph 3.12 *Tetratheca thymifolia*

3.2.3 Priority Weeds

The *Noxious Weeds Act 1993* no longer applies and problematic weeds are handled under the *NSW Biosecurity Act 2015.* The subject land is located within the Priority region for Greater Sydney. There are two exotic species in the subject land listed as priority weeds: *Lantana camara* (Lantana) and *Asparagus aethiopicus* (Ground Asparagus). These species are both listed as Mandatory Measure (must not be imported into the state or sold) and are also listed as Weeds of National Significance.

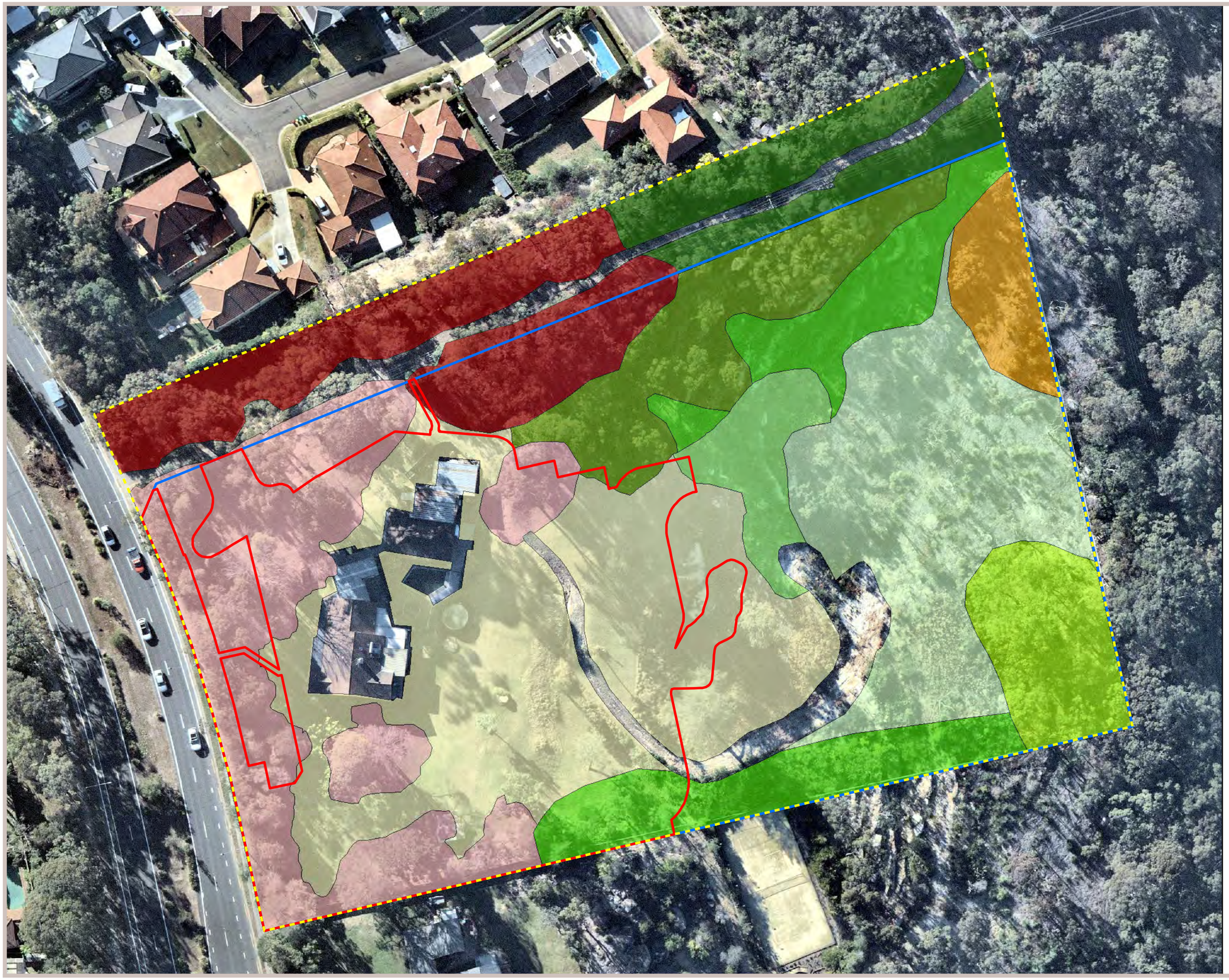

Figure 3.1. Vegetation of the study area

Figure 3.2. Threatened Flora Species Recorded within the Study Area

3.3 Fauna

3.3.1 Fauna Habitat

The vegetation of the subject land provides some potential habitat for native fauna known to occur in the locality, including some threatened species. Microhabitats present within the subject land include three hollow-bearing trees, sandstone outcrops and a small stream. One of the small hollows located within DFEC contained two Feathertail Gliders (*Acrobates pygmaeus*). The details and location of the habitat trees are detailed in **Table 3.2**. These trees and the stream are shown on **Figure 3.3**.

Sandstone outcrops are dominant in the north of the subject land but also occur scattered within the east. In addition to the microhabitats, many exotic flora species are present on the subject land that can provide potential foraging resources for nectivorous mammals and birds that may use the subject land on occasion as part of a larger foraging range.

Table 3.3 Hollow-bearing trees within the subject land

Habitat ID	Easting	Northing	Species	Description of Habitat
H1	335219	6266768	*Eucalyptus globoidea*	Small hollow in trunk
H2	335211	6266794	*Eucalyptus globoidea*	Small hollow in trunk - 2 Feathertail Gliders present
H3	335281	6266785	*Eucalyptus haemastoma*	Medium hollow in trunk

3.3.2 General Species

A total of 12 bird species, one reptile and two mammal species were recorded during opportunistic diurnal surveys. A suite of other native species have the potential to utilise the fauna habitats within the subject land. The list of fauna species recorded within the subject land is provided in **Appendix C**.

3.3.3 Threatened Species

No threatened fauna species have been recorded from the subject land, however a number of threatened fauna species have been recorded from the locality and have the potential to occur within the subject land. **Appendix A** presents an analysis of the likelihood of occurrence within the subject land for each threatened fauna species recorded or predicted

to occur within the locality. This analysis indicates that seven threatened fauna species, and two migratory species have potential to occur within the subject land. A discussion of the potentially occurring threatened fauna species is provided below.

i. Powerful Owl

The Powerful Owl (*Ninox strenua*) is listed as Vulnerable under the BC Act. It is the largest Owl in Australia and reaches 60 cm in length and can have a wingspan of up to 140 cm (OEH 2014b). The Powerful Owl is endemic to eastern and south eastern Australia and in NSW is widely distributed throughout the eastern forests from the coast inland to the tablelands (OEH 2014b). It inhabits a range of vegetation types from woodland and open sclerophyll forest to tall open wet forest and rainforest and generally requires large tracts of forest or woodland habitat by can occur in fragmented landscapes (OEH 2014b). The Powerful Owl requires large tree hollows for nesting that are at least 50cm deep in large old eucalypts that have a diameter at breast height of 80-240 cm, and roosts in dense vegetation (OEH 2014b).

Potential foraging habitat for this species occurs within the subject land, mainly within the remaining forest vegetation in the west of the subject land. No breeding habitat occurs within the subject land as no large hollows suitable for nesting are present. The Powerful Owl is known to utilise fragmented habitat within urban areas, however the subject land is considered to only provide marginal foraging habitat for this species.

ii. Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the BC Act and EPBC Act. The Grey-headed Flying-fox is distributed primarily along the eastern coastal plain from Bundaberg in Queensland, through NSW and south to eastern Victoria (NSW Scientific Committee 2004). Within its extent, the Grey-headed Flying-fox occurs in rainforests, open forest, woodlands, *Melaleuca* swamps and *Banksia* woodlands (NSW Scientific Committee 2004).

Potential foraging habitat for this species occurs within woodland areas in the subject land. Grey-headed Flying-foxes live in specific roost camps, the locations of which are well-known within the Sydney region. No camps were observed within the subject land.

iii. Microchiropteran Bats

The following microchiropteran species may utilise woodland areas in the subject land as part of a wider foraging range: Eastern Freetail-bat (*Mormopterus norfolkensis*), Little Bentwing-bat (*Miniopterus australis*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Southern Myotis (*Myotis macropus*). These species are listed as Vulnerable under the BC Act but are not listed under the EPBC Act.

Microchiropteran bats are highly mobile species that access resources from a large area. They are known to fly over disturbed areas while foraging and are not likely to be dependent on the habitat present in the subject land.

Potential roosting habitat is present for these species in three hollow-bearing trees that were observed in the subject land and in the existing small shed that provides marginal suitable roosting habitat as it contains some cavities.

iv. Migratory Species

Several species listed as migratory under the EPBC Act may potentially pass through the locality. These are the Fork-tailed Swift (*Apus pacificus*) and White-throated Needletail (*Hirundapus caudacutus*) which are aerial species that may forage aerially above the subject land on occasion.

Legend

- Subject Site
- Subject Land
- Study Area

Habitat Features

- Creekline
- Hollow Bearing Trees

Image Source:
Image © NearMap 2018
Dated: 23/7/2018

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 30 m

I:\...\16222\Figures\RP3\20180911\Figure 3.3. Habitat Features_Subject land

Figure 3.3. Habitat Features within the Subject land

Chapter 4

Impact Assessment

4.1 Impacts to Vegetation Communities

The primary impact resulting from the proposed development is the loss or modification of vegetation and associated habitat within the subject land. Past and current use of the subject land has entailed clearing and modification of the majority of native vegetation. The proposed development footprint will require the removal of up to 0.001 ha of Duffys Forest EEC (Regrowing Understorey), a total of 0.05 ha of Coastal Sandstone Heath-Mallee in various states of regeneration (consisting of 0.004 ha with regrowing understorey, 0.04 ha with cleared canopy - regrowing, and 0.001 ha with an exotic dominated ground layer) and 0.27 ha of Urban Native. Exotic grassland (totalling 0.57 ha) will also be removed or rehabilitated with the adjoining native vegetation communities.

A total of 0.08 ha of DFEC is present in the north of the subject land, which extend to the north in the study area (with a total patch area of 0.25 ha. Of this, a total of 0.001 ha will be impacted for the proposed development footprint. In addition to the 0.001 ha impact, additional scattered DFEC canopy trees (up to the northern boundary of the subject land) may be cleared for the purpose of establishing the APZs.

The APZ will be maintained to provide adequate canopy separation in the IPA, as defined in the Bushfire Impact Assessment (Travers Bushfire and Ecology, 2018). However, no canopy clearing will occur in the OPA (as shown in Schedule 1, Bushfire Protection Measures, in Attachment S1 of the Bushfire Impact Assessment (Travers Bushfire and Ecology, 2018)), and this zone will be managed as a reduced fuel zone, but with planting of canopy trees, shrubs and groundcover to create a woodland structure, according to the specifications of the Biodiversity Management Plan that has been prepared for the subject land (Cumberland Ecology, 2018).

A Test of Significance has been provided for this community in **Appendix D**. This test indicates that the proposed development will not have a significant impact on DFEC. Approximately 0.001 ha of the community is proposed to be removed of the 0.08 ha present on the subject land. Within the subject land, many of the shrub species are present either as juveniles regrowing from seed, or as coppiced regrowth from cut stumps from previous clearing activities. DFEC occurs more extensively within the locality along Forest Way and Mona Vale Road north of the subject land, generally in much better condition than in the subject land.

4.2 Impacts to Flora Species

No naturally occurring threatened flora species, listed under the BC Act or EPBC Act were recorded within the subject land. However, one threatened flora species; *Grevillea caleyi*, which is listed as critically endangered under the BC Act and EPBC Act has been recorded in the study area, to the north of a subject land. There is potential habitat for this species on the subject land, in the area of Duffy's Forest present in the north of the subject land. However, no direct removal of the known habitat in the study area will occur, and indirect impacts are considered to be marginal due to the provision of an APZ at the northern boundary, which will provide a buffer to the development. The potential habitat present on the subject land will be modified as part of the APZ, but will be retained with an intact understorey. Accordingly, the proposed development is considered unlikely to have a significant impact upon threatened flora species.

The proposed development has the potential to result in a number of indirect impacts to threatened flora species with potential to occur on the subject land, including:

- Weed invasion;
- Run-off, erosion and sedimentation; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

A number of mitigation measures are proposed to minimise these impacts. These are discussed further in **Chapter 5**.

4.3 Impacts to Fauna Species

The proposed development has the potential to result in a number of direct and indirect impacts to fauna species within the subject land. In addition to the direct removal and modification of vegetation within the subject site, potential indirect impacts to fauna species include:

- Habitat disturbance during the construction phase of the project (e.g. changes in noise);
- Runoff, erosion and sedimentation;
- Increased pollution resulting from fuel spills or water containing suspended solids leaving the construction site;
- Hydrological changes resulting in altered fauna habitats; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

No threatened fauna species have been recorded from the subject land, however a number of threatened fauna species are considered to have the potential to occur (see **Section 3.3.3**). The subject land provides potential foraging opportunities for these threatened fauna but is unlikely to exclusively support a local population of any threatened fauna species. Although these species may forage on or near the subject land from time to time, it would be as part of a much larger home range. A total of 0.32 ha of native vegetation (and an additional 0.57 ha of exotic grassland) is proposed to be removed from 1.99 ha of vegetation on the subject land. Habitat on the subject land is degraded from previous clearing. More optimum foraging and roosting habitat is present in the wider locality, particularly within the large tract of vegetation which eventually connects to Ku-ring-gai Chase National Park.

A Test of Significance for these species is provided in **Appendix D**. This assessment concluded the project is not likely to significantly impact the threatened fauna species that have potential to occur.

The migratory birds that have potential to occur are considered unlikely to utilise the subject land and surrounding vegetation for roosting or feeding as they are highly mobile, aerial species. Therefore the proposed development is not considered likely to have a significant impact on any migratory fauna species.

4.3.1 Loss of Specific Habitat Features

Most of the subject land has already been previously cleared of native vegetation, so there are few specific fauna habitat features remaining.

No hollow-bearing trees or fallen logs will be removed for the proposed development. One tree within the DFEC contains a hollow with Feathertail Gliders (H2); however it is recommended that this tree should be avoided.

Chapter 5

Mitigation Measures

A number of mitigation measures are recommended for the proposed project. These measures should be implemented to minimise impacts to biodiversity on adjoining habitats.

5.1 Vegetation Protection

To avoid unnecessary removal or damage to DFEC vegetation the subject land, the clearing area should be clearly demarcated and signed posted, to ensure that no vegetation (other than exotic groundcover and shrub species) beyond these boundaries is removed. Clearing works and equipment should be excluded from areas outside the clearing area. Site inductions are to be given by the civil contractor to ensure all site workers and visitors are aware of the identified no-access areas.

5.2 Erosion, Sedimentation and Pollution Control

Potential impacts to flora and fauna occurring in the construction phase that can be managed include: run-off, sedimentation, erosion and pollution.

To reduce sedimentation on the construction site, erosion control measures should be implemented. This includes minimising the amount of exposed soils on the site at any given time. All soil stockpiles should be adequately covered when not in use to prevent erosion during heavy rainfall events. Sediment fences should be established around the perimeter of the development area to prevent the impacts of sedimentation on the adjoining vegetation, namely to downslope vegetation.

During construction activities, precautions should be taken to ensure that no pollution, such as petrochemical substances or water containing suspended solids, escapes the construction site. Pollution traps and efficient removal of pollution to an off-site location would help to minimise pollution impacts.

5.3 Pre-clearing Surveys and Clearing Supervision

Pre-clearing surveys will be undertaken by a suitably qualified ecologist. Pre-clearing surveys will include:

- Demarcation of key habitat features such as hollow-bearing trees, fallen logs and bushrock; and

- Provision of a report following the completion of a pre-clearing survey, detailing the location and type of each habitat feature.

To minimise impacts to native fauna species, clearing will be undertaken in the following two-stage process under the supervision of a suitably qualified ecologist:

- The initial phase of clearing will involve clearing around identified habitat features and leaving the features overnight;

- The second stage will involve clearing of the habitat features left overnight followed by an inspection;

An ecologist will investigate all fallen trees for the presence of hollows not detected prior to clearing. Inspections will be undertaken of these hollows for native fauna.

An ecologist will be present while clearing to rescue animals injured during the clearance operation. Provisions will be made to protect any native fauna during clearing activities by the following means:

- All persons working on the vegetation clearing will be briefed about the possible fauna present and should avoid injuring any present;

- Animals disturbed or dislodged during the clearance but not injured should be assisted to move to the adjacent bushland; and

- If animals are injured during the vegetation clearance, appropriate steps will be taken to humanely treat the animal (either taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanised).

5.4 Weed Control Measures

Priority weed species occurring within the subject land will be managed in order to prevent further spread downslope to intact native vegetation. Prior to any vegetation clearance, Priority weeds in the canopy and shrub layers should be demarcated in order for these to be disposed of separately from native material. Priority species present within the subject land are listed in **Section 3.2.3.** Further specifications of weed control measures that will be implemented throughout the subject land are provided in the Biodiversity Management Plan (BMP) that has been prepared for the site.

5.5 Re-vegetation

The main aims of the BMP are to improve the overall biodiversity values of the site. The BMP contains detailed specifications of additional plantings that will occur throughout much of the east of the subject land, which is largely open as a result of past clearing. Any Bushfire APZs will need to be considered when planting shrubs or canopy species.

Chapter 6

Conclusion

Past and current use of the subject land has entailed clearing and modification of the majority of pre-existing native vegetation. Despite the impacts of previous disturbance and location within a fragmented landscape, the proposed development will require the clearing of native vegetation that forms marginal suitable habitat for some threatened fauna species.

The development layout has been modified to ensure that direct and indirect impacts on the EEC present, and the nearby population of *Grevillea caleyi* located in the unformed road easement to the north, are avoided. This includes the modified site access driveway, which has been amended since the previous DA, and is now located to the south of the proposed aged care facility, and a slip lane from Forest Way.

The proposed development footprint will require the removal of up to 0.001 ha of Duffys Forest EEC (Regrowing Understorey), a total of 0.05 ha of Coastal Sandstone Heath-Mallee in various states of regeneration and 0.27 ha of Urban Native. Exotic grassland (totalling 0.57 ha) will also be removed or rehabilitated with the adjoining native vegetation communities.

Within the subject land, DFEC is generally in good condition. It is an open forest with some scattered shrubs, though much of the shrub layer and ground layer are in a state of regrowth following a former clearing event. Up to 0.001 ha of the 0.08 ha of this community on the subject land will be impacted for the development footprint. Additional scattered trees will also likely need to be removed or trimmed for the purpose of APZs.

Vegetation retained on the subject land will be managed as part of an APZ. Due to the previous clearing of canopy and understorey vegetation throughout much of the subject land, it is not expected that additional clearing will be required, except for removal of some scattered trees. All retained vegetation will be managed under a BMP, which will improve the function of the ecological communities present.

The mitigation measures recommended to be implemented include:

- Vegetation protection;
- Erosion, sedimentation and pollution control;
- Pre-clearing and clearing surveys;
- Weed control measures; and

- Re-vegetation.

No significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed development, as demonstrated by the Tests of Significance in **Appendix D**. Therefore, the preparation of a BDAR is not warranted. A referral to the Commonwealth Department of the Environment, under the EPBC Act is also not required.

References

Botanic Gardens Trust. 2016. PlantNET. National Herbarium of NSW, Royal Botanic Garden, Sydney.

Cumberland Ecology. 2018. 181 Forest Way Belrose: Biodiversity Management Plan. Epping, NSW.

DoEE. 2018. EPBC Protected Matters Search Tool. Department of the Environment and Energy.

DPI. 2018. Freshwater threatened species distributions maps. Department of Primary Industries.

Harden, G. J. 1990-1993. Flora of NSW Volumes 1-4. New South Wales University Press, Kensington.

NSW Scientific Committee. 2004. Grey-headed Flying-fox - vulnerable species listing. Department of Environment and Conservation (NSW), Hurstville.

OEH. 2013. The Native Vegetation of the Sydney Metropolitan Area. Office of Environment and Heritage, Sydney.

OEH. 2014a. Little Bentwing-bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2014b. Powerful Owl - profile. Office of Environment and Heritage, Hurstville.

OEH. 2015a. Eastern Freetail-bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2015b. Grey-headed Flying-fox - profile. Office of Environment and Heritage, Hurstville.

OEH. 2015c. Southern Myotis - profile Office of Environment and Heritage, Hurstville

OEH. 2016a. Eastern Bentwing-bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2016b. Greater Broad-nosed Bat - profile. Office of Environment and Heritage, Hurstville.

OEH. 2018. BioNet Atlas. Office of Environment and Heritage.

Stuart Noble Associates. 2018. Belrose Manor, 181 Forest Way Belrose.*in* L. A. D. Set, editor.

Travers Bushfire & Ecology. 2018. Bushfire Protection Assessment Addendum: Proposed Residential Aged Care Facility, Lot 3 DP 805710, 181 Forest Way, Belrose. Kariong NSW.

Appendix A

Likelihood of Occurrence Assessment

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Dilleniaceae	*Hibbertia superans*		E		1	Found in open woodland and heathland often near disturbed areas.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared.
Elaeocarpaceae	*Tetratheca glandulosa*		V		97	Occurs in various habitats including heath, scrub, woodland and forest in areas of shale-sandstone transition habitat. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared. Nearest existing records near Morgan Road several hundred metres north-east of the subject land.
Ericaceae	*Epacris purpurascens* var. *purpurascens*		V		3	Grows in sclerophyll forest, scrubs and swamps on sandstone	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
							has already been cleared. No records on or adjacent to subject land.
Fabaceae (Mimosoideae)	*Acacia terminalis* subsp. *terminalis*	Sunshine Wattle	E	E	10	Occurs in open coastal eucalypt woodland or forest, often on sandy soil. Most records located from Port Jackson area.	Unlikely to occur. No suitable habitat present on the subject land.
Fabaceae (Mimosoideae)	*Acacia bynoeana*	Bynoe's Wattle	E	V	0	Found in heath and woodland on sandy soils. Prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared.
Fabaceae (Mimosoideae)	*Acacia pubescens*	Downy Wattle	V	V	0	Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. Main concentration of the species occurs around the Bankstown-Fairfield-Rookwood area and Pitt Town area.	Unlikely to occur. No suitable habitat present on the subject land.

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Geraniaceae	*Pelargonium* sp. (G.W. Carr 10345)	Omeo Storksbill	E	E	0	Occurs above the high-water level of irregularly inundated or ephemeral lakes - in the transition zone between grassland/pasture and wetland/aquatic communities.	Unlikely to occur. No suitable habitat present on the subject land.
Haloragaceae	*Haloragodendron lucasii*		E	E	9	Found in dry sclerophyll forest, growing on moist sandy loam soils in sheltered aspects.	Unlikely to occur. No suitable habitat present on the subject land.
Lamiaceae	*Prostanthera marifolia*	Seaforth Mintbush	CE	CE	4	Occurs in localised patches in or in close proximity to the endangered Duffys Forest ecological community.	Unlikely to occur. No suitable habitat present on the subject land.
Myrtaceae	*Callistemon linearifolius*	Netted Bottle Brush	V		7	Found in dry sclerophyll forest.	Unlikely to occur. No suitable habitat present on the subject land.
Myrtaceae	*Darwinia biflora*		V	V	1	Occurs in Sandstone Ridgetop woodlands where the weathered shale-capped ridges intergrade with Hawkesbury Sandstone.	Unlikely to occur. No suitable habitat present on the subject land.
Myrtaceae	*Eucalyptus camfieldii*	Camfield's Stringybark	V	V	31	Found in coastal heath more commonly on exposed sandy ridges overlying Hawkesbury	Unlikely to occur. No suitable habitat present on the subject land.

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						Sandstone. Often seen near the boundary of tall coastal heath and low open woodland.	
Myrtaceae	*Eucalyptus nicholii*	Narrow-leaved Black Peppermint	V	V	3	Grows in dry grassy woodland on shallow soils of slopes and ridges.	Unlikely to occur. No suitable habitat present on the subject land.
Myrtaceae	*Eucalyptus scoparia*	Wallangarra White Gum	E	V	1	Occurs in open eucalypt forest, woodland and heath on well-drained hilltops, slopes and rocky outcrops usually at high altitudes.	Present on the subject land. Planted individual within the north of the subject land near garage.
Myrtaceae	*Leptospermum deanei*		V	V	4	Grows in riparian shrubland, woodland and open forest on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone.	Unlikely to occur. No suitable habitat present on the subject land.
Myrtaceae	*Melaleuca deanei*	Deane's Paperbark	V	V	4	Found in marshy heath on coastal sandstone plateaus. Restricted to sandstones of Sydney and south coast.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E	V	4	Subtropical and littoral rainforest	Present on the subject

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						species growing on sandy soils.	land. Planted tree within the north of the subject land next to existing residential dwelling.
Myrtaceae	*Kunzea rupestris*		V	V	0	Found in shrubland and heathland in shallow depressions on large flat sandstone rock outcrops.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared.
Myrtaceae	*Melaleuca biconvexa*	Biconvex Paperbark	V	V	0	Prefers damp places on alluvial soils, commonly near streams or low-lying areas. Known from the Jervis Bay and Gosford-Wyong areas.	Unlikely to occur. No suitable habitat present on the subject land.
Myrtaceae	*Triplarina imbricata*	Creek Triplarina	E	E	0	Found along watercourses in low open forest with *Tristaniopsis laurina* (Water Gum) or in montane bogs, often with *Baeckea amissa*.	Unlikely to occur. No suitable habitat present on the subject land.
Orchidaceae	*Genoplesium baueri*	Bauer's Midge Orchid	E	E	45	Found in moss gardens over sandstone and dry sclerophyll	Unlikely to occur. No suitable habitat present

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						forest.	on the subject land.
Orchidaceae	*Microtis angusii*	Angus's Onion Orchid	E	E	81	Currently known from only one highly disturbed site at Ingleside, north of Sydney. Occurs on soils that have been modified but were originally those of the restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas.	Unlikely to occur. No suitable habitat present on the subject land.
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue-orchid	V	V	0	Found in various communities such as woodland, swamp--heath, grassland, rainforest and freshwater wetlands. Grows mainly on moist sandy soils but can also grow on dry peat soils.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared.
Poaceae	*Deyeuxia appressa*		E	E	0	Unknown habitat requirements, but known to grow on wet ground. Species not sighted for over 60 years and known only from two records before 1942 (from Herne Bay, Saltpan Creek and Killara).	Unlikely to occur. No suitable habitat present on the subject land.
Proteaceae	*Grevillea caleyi*	Caley's Grevillea	CE	E	663	All sites occur on the ridgetop	Unlikely to occur.

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi and E. gummifera*. Commonly found in the endangered Duffys Forest ecological community.	Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared. Numerous records of the species are located between the subject land and south of Oates Place, but the species was not recorded during the site inspection.
Proteaceae	*Persoonia hirsuta*	Hairy Geebung	E	E	25	Grows in dry sclerophyll open forest, woodland and heath on sandstone on sandy soils.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared.
Proteaceae	*Persoonia mollis* subsp. *maxima*		E	E	0	Found in relatively moist, tall forest vegetation communities in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies on Hawkesbury Sandstone.	Unlikely to occur. No suitable habitat present on the subject land.

Table A.1 Threatened flora likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Rutaceae	*Asterolasia elegans*		E	E	0	Grows in sheltered forests on Hawkesbury Sandstone on mid/lower slopes and valleys.	Unlikely to occur. No suitable habitat present on the subject land.
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	0	More commonly found growing with *Themeda australis* (Kangaroo Grass). Found in grassland on coastal headlands/grassland and grassy woodland away from the coast.	Unlikely to occur. No suitable habitat present on the subject land.
Thymelaeaceae	*Pimelea curviflora* var. *curviflora*		V	V	21	Grows in open forest and woodland on ridges and upper slopes. Preference for sandy soils derived from sandstone.	Unlikely to occur. Highly marginal suitable habitat present on the subject land. The majority of the native vegetation has already been cleared.

CE = Endangered, E = Endangered, V = Vulnerable,

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	1	Permanent or ephemeral swamps, dams and slow flowing streams with emergent vegetation such as reeds, particularly those containing bulrushes (*Typha* spp.) and Spikerushes (*Eleocharis* spp.). Optimal habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and sheltering sites available. Can occur in highly disturbed areas. It inhabits a variety of forest types including coastal forest, open woodland and cleared areas.	Unlikely to occur. No suitable habitat on the subject land.
Hylidae	*Litoria littlejohni*	Littlejohn's Tree Frog	V	V	0	Occurs in heath based forests and woodlands. Breeding habitat occurs in upper reaches	Unlikely to occur. No suitable habitat on the subject land.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						of permanent streams and in perched swamps.	
Myobatrachidae	*Heleioporus australiacus*	Giant Burrowing Frog	V	V	15	Ephemeral or semi-permanent small sandy streams in heathland or open woodland are used for breeding. Foraging may occur several hundred metres from a breeding site within the same habitat.	Unlikely to occur. No suitable habitat on the subject land.
Myobatrachidae	*Pseudophryne australis*	Red-crowned Toadlet	V		148	Occurs in open forests, at periodically wet drainage lines below sandstone ridges. Mainly found on Hawkesbury and Narrabeen Sandstones.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared. More suitable habitat would have been available for the species prior to vegetation clearance that has occurred on the subject land.
Myobatrachidae	*Mixophyes balbus*	Stuttering Frog	E	V	0	Permanent flowing rocky rivers and streams. It inhabits	Unlikely to occur. No suitable habitat on the

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						rainforest, wet sclerophyll forest and montane forests, it is rarely encountered far from a stream.	subject land.
Aves							
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle		C	0	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands.	Unlikely to occur. No suitable habitat on the subject land.
Accipitridae	*Hieraaetus morphnoides*	Little Eagle	V		2	Inhabits open eucalypt forest and woodland as well as she-oak/acacia or riparian woodlands in drier areas. It nests in tall trees within a remnant patch.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Accipitridae	*Lophoictinia isura*	Square-tailed Kite	V		1	Found in a variety of timbered habitats including dry woodlands and open forests. It is a specialist hunter preying on passerine birds, especially	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						honeyeaters and targets predominately nestlings and insects occurring in the tree canopy. It nests in tree forks or on large horizontal tree limbs located mostly along or near watercourses.	vegetation has already been cleared.
Accipitridae	*Pandion cristatus*	Eastern Osprey	V		3	Found at coastal areas, especially the mouths of large rivers, lagoons and lakes. Nests in trees typically within 1km of the sea.	Unlikely to occur. No suitable habitat on the subject land.
Apodidae	*Hirundapus caudacutus*	White-throated Needletail		C,J,K	0	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Potential to occur. Highly mobile, aerial species that may pass over the subject land but unlikely to utilise it directly.
Apodidae	*Apus pacificus*	Fork-tailed Swift		C,J,K	0	Forages aerially over a variety of habitats usually over coastal and mountain areas with a	Potential to occur. Highly mobile, aerial species that may pass over the

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						preference for wooded areas.	subject land but unlikely to utilise it directly.
Ardeidae	*Botaurus poiciloptilus*	Australasian Bittern	E	E	0	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes.	Unlikely to occur. No suitable habitat on the subject land.
Ardeidae	*Ixobrychus flavicollis*	Black Bittern	V		12	Requires areas of permanent water with dense vegetation.	Unlikely to occur. No suitable habitat on the subject land.
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V		6	Occurs in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations.	Unlikely to occur. No suitable habitat on the subject land.
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew	E		1	Lives in open forest and woodlands with a sparse, grassy ground layer, and fallen timber. It feeds on insects and small insects and vertebrates including frogs, lizards, and snakes. Nesting is undertaken in a scrape or small bare patch.	Unlikely to occur. No suitable habitat on the subject land.
Burhinidae	*Esacus magnirostris*	Beach Stone-curlew	CE		1	Occurs exclusively along the	Unlikely to occur.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves.	No suitable habitat on the subject land.
Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V		1	In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. Favours old growth attributes for nesting and roosting.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Cacatuidae	^^*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V		63	Eucalypt forests and woodlands and forage in *Allocasuarina.* Nest in large tree hollows.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V		2	Found in rainforest and similar closed forests, but also found in eucalypt or acacia woodland also less commonly.	Unlikely to occur. No suitable habitat on the subject land.
Cuculidae	*Cuculus optatus*	Oriental Cuckoo		M	0	Inhabits forest and woodland.	Unlikely to occur. Although marginal suitable habitat present on the subject land, the species is sparsely recorded in NSW.
Dasyornithidae	*Dasyornis brachypterus*	Eastern Bristlebird	E	E	0	Inhabits dense, low vegetation in heath and open woodland, and open forest with dense grass understorey and sparse mid-storey. Nests on or near ground in dense vegetation.	Unlikely to occur. No suitable habitat on the subject land.
Meliphagidae	*Grantiella picta*	Painted Honeyeater	V	V	0	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	Unlikely to occur. No suitable habitat on the subject land.
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	CE	2	Inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Also found in drier coastal woodlands and forests in some years. The species inhabits dry	Unlikely to occur. No suitable habitat on the subject land.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Breeds in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak, usually nest in tall mature eucalypts and Sheoaks.	
Monarchidae	*Myiagra cyanoleuca*	Satin Flycatcher		M	0	Found in rainforest, dense wet eucalypt and monsoon forests, paperbark and mangrove swamps and riverside vegetation.	Unlikely to occur. No suitable habitat on the subject land.
Monarchidae	*Monarcha trivirgatus*	Spectacled Monarch		M	0	Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	Unlikely to occur. No suitable habitat on the subject land.
Monarchidae	*Monarcha melanopsis*	Black-faced Monarch		M	0	Wetter, denser forest, often at	Unlikely to occur.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						high elevations.	No suitable habitat on the subject land.
Motacillidae	*Motacilla flava*	Yellow Wagtail		C,J,K	0	Prefers moist areas, such as the edges of sewage works and exposed mudbanks.	Unlikely to occur. No suitable habitat on the subject land.
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V		2	Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Petroicidae	*Petroica boodang*	Scarlet Robin	V		2	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands	Unlikely to occur. No suitable habitat on the subject land.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	
Psittacidae	*Glossopsitta pusilla*	Little Lorikeet	V		4	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also utilises isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked	Possible but unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						Eucalypts.	
Psittacidae	*Lathamus discolor*	Swift Parrot	E	CE	12	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark, and *E. albens* (White Box). Breeds in Tasmania in spring and summer.	Possible but unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail		M	0	Inhabits rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground.	Unlikely to occur. No suitable habitat on the subject land.
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	E	E	0	Inhabits fringes of shallow inland wetlands, swamps,	Unlikely to occur. No suitable habitat on the

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	subject land.
Scolopacidae	*Tringa nebularia*	Common Greenshank		C,J,K	0	Inhabits estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops.	Unlikely to occur. No suitable habitat on the subject land.
Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit		C,J,K	0	Inhabits estuarine mudflats, beaches and mangroves.	Unlikely to occur. No suitable habitat on the subject land.
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe		C,J,K	0	Found in freshwater wetlands among dense cover.	Unlikely to occur. No suitable habitat on the subject land.
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	E	CE,C,J,K	0	Occurs mainly on intertidal mudflats in coastal areas including sheltered estuaries and bays. Less often found inland in appropriate water sources such as dams and lakes.	Unlikely to occur. No suitable habitat on the subject land.
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew		CE,C,J,K	0	Prefers sheltered coasts, especially estuaries, bays,	Unlikely to occur. No suitable habitat on the

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						harbours, inlets and lagoons. Also known to occur in sewage farms, wetlands and mangroves. Species roosts on sandy spits and in low Saltmarsh or mangroves.	subject land.
Strigidae	*Ninox connivens*	Barking Owl	V		9	Found in open forest and woodland, including fragmented remnants, often next to farmland.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Strigidae	*Ninox strenua*	Powerful Owl	V		178	A variety of forest types including woodland, open sclerophyll forest, tall open wet forest, rainforest and occasionally fragmented areas. Territories may be as large as 1450 ha and nesting occurs in large tree hollows of old, mature trees.	Potential to occur. This species will use fragmented habitats and may pass through the subject land as part of a larger foraging area. Scattered records throughout the locality.
Tytonidae	*Tyto novaehollandiae*	Masked Owl	V		1	Roosts and breeds in moist eucalypt forested gullies, using	Unlikely to occur. No suitable habitat on the

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						large tree hollows or sometimes caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides.	subject land.
Tytonidae	*Tyto tenebricosa*	Sooty Owl	V		2	Occurs in coastal rainforest, including dry, subtropical, and temperate rainforests, and moist eucalypt forests. Utilises tall trees in heavily vegetated areas for day time resting. It hunts during the night for small ground or tree dwelling mammals such as the Common Ringtail Possum or Sugar Glider. The species requires very large tree hollows for nesting.	Unlikely to occur. No suitable habitat on the subject land.
Mammalia							
Burramyidae	*Cercartetus nanus*	Eastern Pygmy-possum	V		152	Found in forested areas from rainforest to sclerophyll forest and heath. Breeds in tree	Possible but unlikely to occur. Highly marginal suitable

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						hollows or round nests hidden under bark on tree trunks.	habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	16	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. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creeklines.	Unlikely to occur. No suitable habitat on the subject land.
Macropodidae	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E	V	0	Occurs where there are rocky escarpments, outcrops and cliffs.	Unlikely to occur. No suitable habitat on the subject land.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Molossidae	*Mormopterus norfolkensis*	Eastern Freetail-bat	V		5	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Potential to occur. Highly mobile species which may pass over the subject land as part of a much larger foraging range.
Muridae	*Pseudomys novaehollandiae*	New Holland Mouse		V	4	Found in open heathlands, woodlands and forests. Requires heathland understorey and vegetated sand dunes. Breeds in burrows.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Peramelidae	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E	E	116	Crepuscular species found in heath or open forest (with heath understorey) on sandy or friable soils. Nests in shallow depression in the ground hidden by leaf litter or grass.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	2	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	majority of the native vegetation has already been cleared.
Pseudocheiridae	*Petauroides volans*	Greater Glider		V	0	Occurs in eucalypt forests and woodlands from north-eastern Queensland to the Central Highlands of Victoria. The species has a relatively small home range which consists of numerous tree hollows.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	91	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosts in large camps and disperses nightly up to 20km to feed in flowering eucalypts.	Potential to occur. Highly mobile species often foraging in urban areas. No roost camps present on or adjacent to subject land.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	3	Generally rare with a very patchy distribution in NSW. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to midelevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies. This species probably forages for small, flying insects below the forest canopy.	Unlikely to occur. No suitable habitat on the subject land and no roosting habitat near the subject land.
Vespertilionidae	*Miniopterus australis*	Little Bentwing-bat	V		15	Found in various habitat including moist eucalypt forest, rainforest, wet and dry sclerophyll forest. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day.	Potential to occur. Highly mobile species which may pass over the subject land as part of a much larger foraging range.

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V		76	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Potential to occur. Highly mobile species which may pass over the subject land as part of a much larger foraging range.
Vespertilionidae	*Myotis macropus*	Southern Myotis	V		26	Roosts close to water in caves, mines, tree hollows, storm water channels, bridges, buildings or in dense foliage. Forages over streams and pools catching insects and fish.	Potential to occur. Highly mobile species which may pass over the subject land as part of a much larger foraging range.
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V		3	Usually in tall wet forest, extending into drier forest along gullies. Forages along creek and river corridors. Roosts in tree hollows.	Potential to occur. Highly mobile species which may pass over the subject land as part of a much larger foraging range.
Reptilia							
Elapidae	*Hoplocephalus bungaroides*	Broad-headed Snake	E	V	0	Found under rock crevices and flat sandstone rocks on exposed cliff ledges for most of the year, and shelters in	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the

Table A.2 Threatened fauna likelihood of occurrence within the subject land

Family	Scientific Name	Common Name	BC Act	EPBC Act	Records	Habitat Requirements	Likelihood of Occurrence
						crevices/tree hollows in summer.	majority of the native vegetation has already been cleared.
Varanidae	*Varanus rosenbergi*	Rosenberg's Goanna	V		112	Occurs in open forests, woodland and heath where termite mounds occur.	Unlikely to occur. Highly marginal suitable habitat present on the subject land, although the majority of the native vegetation has already been cleared.

CE = Endangered, E = Endangered, V = Vulnerable, M = Migratory, C = Listed on China Australia Migratory Bird Agreement, J = Listed on Japan Australia Migratory Bird Agreement , K = Listed on Republic of Korea Australia Migratory Bird Agreement

Appendix B

Flora species list

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Canopy								
Altingiaceae	*	*Liquidambar styraciflua*						X
Arecaceae	*	*Syagrus romanzoffiana*	Cocos Palm					X
Casuarinaceae	P	*Casuarina glauca*	Swamp Oak					X
Moraceae	*	*Ficus microcarpa* var. *hillii*	Hill's Fig					X
Moraceae	*	*Ficus benjamina*	Deciduous Fig					X
Myrtaceae		*Angophora costata*	Sydney Red Gum			X	bc	
Myrtaceae		*Corymbia gummifera*	Red Bloodwood	X	X		bc	
Myrtaceae	*	*Eucalyptus cladocalyx*	Sugar Gum					X
Myrtaceae		*Eucalyptus globoidea*	White Stringybark	X	X			
Myrtaceae	P	*Eucalyptus globulus subsp. globulus*	Tasmanian Bluegum	X				
Myrtaceae		*Eucalyptus piperita*	Sydney Peppermint				bc	
Myrtaceae	P	*Eucalyptus scoparia*	Wallangarra White Gum	X				
Myrtaceae		*Eucalyptus sieberi*	Silvertop Ash		X		bc	
Myrtaceae	*	*Lophostemon confertus*	Brush Box					X
Myrtaceae		*Syncarpia glomulifera*	Turpentine					X
Myrtaceae	P	*Syzygium paniculatum*	Magenta Lilly Pilly					X
Pinaceae	*	*Pinus radiata*	Radiata Pine					X

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Sub-canopy								
Anacardiaceae	*	*Schinus areira*	Pepper Tree					X
Arecaceae	*	*Archontophoenix cunninghamiana*	Bangalow Palm					X
Bignoniaceae	*	*Jacaranda mimosifolia*	Jacaranda					X
Casuarinaceae		*Allocasuarina distyla*	Scrub She-oak	X			X	
Casuarinaceae		*Allocasuarina littoralis*	Black She-oak	X				
Casuarinaceae	P	*Allocasuarina torulosa*	Forest Oak					X
Cupressaceae	*	*Cupressus sp.*						X
Cupressaceae	*	*Metasequoia glyptostroboides*	Dawn Redwood					X
Fabaceae (Mimosoideae)		*Acacia decurrens*	Black Wattle			X		X
Melastomataceae	*	*Tibouchina* sp.						X
Myrtaceae	P	*Callistemon salignus*						X
Myrtaceae		*Corymbia gummifera*	Red Bloodwood	X		X	X	
Myrtaceae		*Eucalyptus haemastoma*	Scribbly Gum	X		X	X	X
Myrtaceae		*Eucalyptus globoidea*	White Stringybark		X			
Myrtaceae	P	*Melaleuca styphelioides*	Prickly-leaved Tea Tree					X
Phyllanthaceae		*Glochidion ferdinandi*	Cheese Tree				bc	
Pittosporaceae		*Pittosporum undulatum*	Native Daphne					X
	*	*Prunus persica*	Peach Tree					X

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Shrubs								
Anacardiaceae	*	*Harpephyllum caffrum*	Kaffir Plum					X
Apiaceae		*Platysace linearifolia*		X				
Asteraceae	*	*Chrysanthemoides monilifera*	Bitou Bush			X		
Casuarinaceae		*Allocasuarina distyla*	Scrub She-oak			X		
Cunoniaceae		*Bauera rubioides*	River Rose	X			bc	
Dilleniaceae		*Hibbertia empetrifolia* subsp. *empetrifolia*			X			
Dilleniaceae		*Hibbertia linearis*				X		
Elaeocarpaceae		*Elaeocarpus reticulatus*	Blueberry Ash	X				
Ericaceae (Epacridoideae)		*Woollsia pungens*		X		X		
Ericaceae (Epacridoideae)		*Epacris crassifolia* subsp. *crassifolia*		X				
Ericaceae (Epacridoideae)		*Leucopogon microphyllus*		X				
Ericaceae (Epacridoideae)		*Epacris microphylla*	Coast Coral Heath	X		X		
Ericaceae (Epacridoideae)		*Epacris pulchella*	Wallum Heath	X				
Ericaceae (Epacridoideae)		*Styphelia triflora*	Red Five-Corner			X		
Ericaceae (Epacridoideae)		*Lissanthe strigosa*	Peach Heath				X	
Fabaceae (Faboideae)		*Bossiaea heterophylla*	Variable Bossiaea	X				
Fabaceae (Faboideae)		*Pultenaea stipularis*	Handsome Bush-pea	X				
Fabaceae (Faboideae)		*Phyllota phylicoides*	Heath Phyllota	X	X		bc	

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Fabaceae (Faboideae)		*Bossiaea scolopendria*				X		
Fabaceae (Faboideae)		*Viminaria juncea*	Golden Spray				X	
Fabaceae (Faboideae)		*Dillwynia retorta*					X	
Fabaceae (Faboideae)	*	*Erythrina crista-galli*	Cockspur Coral Tree					X
Fabaceae (Caesalpinioideae)	*	*Senna pendula*		X		X	bc	X
Fabaceae (Mimosoideae)		*Acacia longifolia* subsp. *longifolia*	Sydney Golden Wattle	X		X	X	
Fabaceae (Mimosoideae)		*Acacia suaveolens*	Sweet Wattle	X		X	bc	
Fabaceae (Mimosoideae)		*Acacia myrtifolia*	Red-stemmed Wattle	X		X		
Fabaceae (Mimosoideae)		*Acacia floribunda*	White Sally Wattle		X			
Fabaceae (Mimosoideae)		*Acacia stricta*	Straight Wattle		X		X	
Fabaceae (Mimosoideae)		*Acacia ulicifolia*	Prickly Moses		X		X	
Fabaceae (Mimosoideae)		*Acacia terminalis* subsp. *angustifolia*	Sunshine Wattle				bc	
Goodeniaceae		*Dampiera purpurea*		X				
Goodeniaceae		*Scaevola ramosissima*	Purple Fan-flower	X				
Malaceae	*	*Cotoneaster glaucophyllus*						X
Myrtaceae		*Kunzea ambigua*	Tick Bush	X	X	X	X	
Myrtaceae		*Leptospermum squarrosum*	Peach Blossom Tea-tree	X		X	X	
Myrtaceae		*Leptospermum trinervium*	Flaky-barked Tea-tree	X	X			
Myrtaceae		*Angophora hispida*	Dwarf Apple			X		
Myrtaceae		*Baeckea imbricata*	Fringed Baeckea			X		

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Myrtaceae		*Leptospermum polygalifolium*	Tantoon				bc	
Myrtaceae	P	*Syzygium australe*	Brush Cherry					X
Myrtaceae	P	*Tristaniopsis laurina*	Water Gum					X
Myrtaceae		*Angophora costata*	Sydney Red Gum					X
Ochnaceae	*	*Ochna serrulata*	Mickey Mouse Plant					X
Oleaceae	*	*Ligustrum sinense*	Small-leaved Privet				bc	
Pittosporaceae		*Pittosporum undulatum*	Native Daphne	X	X	X		
Proteaceae		*Banksia ericifolia*	Heath-leaved Banksia	X			X	
Proteaceae		*Hakea gibbosa*	Needlebush	X	X		bc	
Proteaceae		*Grevillea buxifolia*	Grey Spider Flower	X				
Proteaceae		*Grevillea sericea*	Pink Spider Flower	X	X		X	
Proteaceae		*Persoonia pinifolia*	Pine-leaved Geebung	X			bc	
Proteaceae		*Banksia serrata*	Old-man Banksia	X			X	
Proteaceae		*Lomatia silaifolia*	Crinkle Bush	X				
Proteaceae		*Banksia oblongifolia*	Fern-leaved Banksia		X			
Proteaceae		*Persoonia levis*	Broad-leaved Geebung		X			
Proteaceae		*Lambertia formosa*	Mountain Devil		X			
Proteaceae		*Petrophile pulchella*	Conesticks			X		
Proteaceae		*Hakea propinqua*					bc	
Rutaceae		*Crowea saligna*		X				

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Rutaceae		*Boronia ledifolia*	Showy Boronia	X		X	X	
Solanaceae	*	*Solanum mauritianum*	Wild Tobacco Bush	X		X		X
Theaceae	*	*Camellia* sp.						X
Thymelaeaceae		*Pimelea linifolia*	Slender Rice Flower			X		
Verbenaceae	*	*Lantana camara*	Lantana				X	
Dicots								
Apiaceae		*Xanthosia pilosa*	Woolly Xanthosia	X			X	
Apiaceae		*Xanthosia tridentata*	Rock Xanthosia	X		X	bc	
Apiaceae		*Actinotus minor*	Lesser Flannel Flower	X			X	
Apiaceae		*Actinotus helianthi*	Flannel Flower	X		X	X	
Apiaceae		*Centella asiatica*	Indian Pennywort				X	
Apiaceae	*	*Cyclospermum leptophyllum*	Slender Celery				bc	
Asteraceae	*	*Bidens pilosa*	Cobblers Pegs	X		X	bc	X
Asteraceae	*	*Cirsium vulgare*	Spear Thistle	X	X	X		X
Asteraceae	*	*Ageratina adenophora*	Crofton Weed			X	bc	
Asteraceae	*	*Conyza bonariensis*	Flaxleaf Fleabane			X		
Asteraceae	*	*Conyza sumatrensis*	Tall Fleabane			X	X	X
Asteraceae	*	*Coreopsis lanceolata*	Coreopsis			X		
Asteraceae	*	*Hypochaeris radicata*	Catsear				bc	X

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Asteraceae	*	*Sonchus asper*	Prickly Sowthistle				bc	X
Asteraceae	*	*Facelis retusa*	Annual Trampweed					X
Asteraceae	*	*Gamochaeta americana*	Cudweed					X
Clusiaceae	*	*Hypericum perforatum*	St. Johns Wort				bc	
Droseraceae		*Drosera spatulata*		X			X	
Elaeocarpaceae		*Tetratheca ericifolia*		X				
Fabaceae (Faboideae)	*	*Lotus uliginosus*	Birds-foot Trefoil				X	
Gentianaceae	*	*Centaurium tenuiflorum*				X	bc	X
Geraniaceae		*Geranium solanderi*	Native Geranium	X	X			
Goodeniaceae		*Dampiera stricta*		X			bc	
Goodeniaceae		*Goodenia paniculata*	Branched Goodenia	X		X		
Goodeniaceae		*Scaevola ramosissima*	Purple Fan-flower			X		
Haloragaceae		*Gonocarpus teucrioides*	Raspwort	X		X	X	
Loganiaceae		*Mitrasacme paludosa*		X				
Loganiaceae		*Mitrasacme polymorpha*				X	X	
Malvaceae	*	*Modiola caroliniana*	Red-flowered Mallow					X
Malvaceae	*	*Sida rhombifolia*	Paddy's Lucerne					X
Myrsinaceae	*	*Anagallis arvensis*	Scarlet Pimpernel			X	bc	X
Phyllanthaceae		*Poranthera ericifolia*		X				
Phytolaccaceae	*	*Phytolacca octandra*	Inkweed	X		X		

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Plantaginaceae	*	*Plantago lanceolata*	Lamb's Tongues		X			X
Rubiaceae		*Opercularia aspera*	Hairy Stinkweed	X				
Solanaceae	*	*Solanum mauritianum*	Wild Tobacco Bush	X				
Solanaceae	*	*Solanum pseudocapsicum*	Madeira Winter	X				
Solanaceae	*	*Solanum sisymbriifolium*		X		X		
Solanaceae	*	*Physalis peruviana*	Cape Gooseberry			X		
Stackhousiaceae		*Stackhousia viminea*	Slender Stackhousia	X				
Verbenaceae	*	*Verbena bonariensis*	Purpletop			X	bc	
Ferns and Allies								
Dennstaedtiaceae		*Pteridium esculentum*	Common Bracken	X	X			
Dennstaedtiaceae		*Histiopteris incisa*	Bat's Wing Fern	X		X		
Dennstaedtiaceae		*Hypolepis muelleri*	Harsh Ground Fern			X	bc	
Dicksoniaceae		*Calochlaena dubia*	Rainbow Fern	X		X		
Gleicheniaceae		*Gleichenia dicarpa*		X		X	X	
Gleicheniaceae		*Gleichenia rupestris*		X			X	
Lindsaeaceae		*Lindsaea linearis*	Screw Fern	X				
Lomariopsidaceae	*	*Nephrolepis cordifolia*	Fishbone Fern			X	bc	X
Pteridaceae		*Adiantum aethiopicum*	Common Maidenhair					X

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Climbers/Vines								
Apocynaceae	*	*Trachelospermum jasminoides*	Star Jasmine	X				
Araliaceae	*	*Hedera helix*	English Ivy					X
Caprifoliaceae	*	*Lonicera japonica*	Japanese Honeysuckle	X				
Smilacaceae		*Smilax glyciphylla*	Sweet Sarsaparilla	X	X			
Fabaceae (Faboideae)	*	*Wisteria sinensis*	Chinese Wisteria					X
Monocots (Grasses)								
Poaceae	*	*Andropogon virginicus*	Whisky Grass			X	X	
Poaceae		*Anisopogon avenaceus*	Oat Speargrass	X		X	X	
Poaceae		*Arundo donax 'Variegata'*	Variegated Giant Reed		X			
Poaceae	*	*Avena barbata*	Bearded Oats					X
Poaceae	*	*Axonopus fissifolius*	Narrow-leafed Carpet Grass			X		
Poaceae	*	*Briza minor*	Shivery Grass				bc	
Poaceae	*	*Bromus catharticus*	Prairie Grass		X			
Poaceae	*	*Cortaderia selloana*	Pampas Grass			X		
Poaceae	*	*Cynodon dactylon*	Couch			X		X
Poaceae	*	*Ehrharta erecta*	Panic Veldtgrass	X	X	X		X
Poaceae		*Entolasia stricta*	Wiry Panic	X	X	X	X	
Poaceae		*Imperata cylindrica*	Blady Grass				bc	

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Poaceae		*Lachnagrostis filiformis*					bc	
Poaceae	*	*Lolium perenne*	Perennial Ryegrass		X			
Poaceae		*Microlaena stipoides*	Weeping Grass	X			X	
Poaceae		*Oplismenus aemulus*	Australian Basket Grass			X		
Poaceae		*Panicum simile*	Two-colour Panic			X		
Poaceae	*	*Paspalum dilatatum*	Paspalum	X	X	X	X	X
Poaceae	*	*Cenchrus clandestinus*	Kikuyu Grass		X	X	bc	X
Poaceae	*	*Setaria parviflora*				X	bc	
Poaceae	*	*Sporobolus africanus*	Parramatta Grass					X
Monocots (Other)								
Alliaceae	*	*Agapanthus praecox* subsp. *orientalis*	African Lily					X
Amaryllidaceae	*	*Clivia miniata*						X
Araceae	*	*Monstera deliciosa*	Fruit Salad Plant					X
Asparagaceae	*	*Asparagus aethiopicus*	Ground Asparagus	X				
Blandfordiaceae		*Blandfordia nobilis*	Christmas Bells	X		X		
Commelinaceae		*Commelina cyanea*		X				
Commelinaceae	*	*Tradescantia pallida*	Purple Queen					X
Cyperaceae		*Gahnia clarkei*	Tall Saw-sedge	X				
Cyperaceae		*Lepidosperma laterale*		X	X		bc	

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Cyperaceae		*Schoenus brevifolius*	Zig-zag Bog-rush	X	X		bc	
Cyperaceae		*Cyathochaeta diandra*		X	X			
Cyperaceae		*Schoenus apogon*	Common Bog-rush	X		X	X	
Cyperaceae		*Gahnia sieberiana*	Red-fruit Saw-sedge	X		X	X	
Cyperaceae		*Caustis pentandra*	Thick Twist Rush	X				
Cyperaceae	*	*Cyperus eragrostis*	Umbrella Sedge			X	X	
Cyperaceae		*Cyperus difformis*				X		
Cyperaceae		*Cyperus polystachyos*				X	X	
Cyperaceae	*	*Cyperus brevifolius*	Mullumbimby Couch			X		X
Cyperaceae		*Isolepis inundata*					X	
Cyperaceae		*Lepidosperma gunnii*		X				
Cyperaceae		*Ptilotrix deusta*		X				
Iridaceae		*Patersonia sericea*	Silky Purple-flag	X	X			
Iridaceae	*	*Sisyrinchium rosulatum*	Scourweed				X	
Iridaceae	*	*Sisyrinchium micranthum*	Blue Pigroot					X
Juncaceae		*Juncus planifolius*		X		X	X	
Juncaceae		*Juncus usitatus*				X	X	
Juncaceae	*	*Juncus cognatus*					X	
Lomandraceae		*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush	X				
Lomandraceae		*Lomandra glauca*	Pale Mat-rush	X	X		X	

Table A.1 Flora species list

Family	Exotic	Scientific Name	Common Name	RMS1	RMS2	RMS3	RMS4	RMS5
Lomandraceae		*Lomandra obliqua*			X		X	
Orchidaceae		*Cryptostylis subulata*	Large Tongue Orchid	X	X			
Orchidaceae	P	*Dendrobium* sp.						
Phormiaceae		*Dianella caerulea* var. *producta*		X	X	X		
Phormiaceae		*Dianella prunina*		X				
Restionaceae		*Lepyrodia scariosa*		X	X			
Restionaceae		*Empodisma minus*	Spreading Rope-rush	X	X	X	X	
Stylidiaceae		*Stylidium graminifolium*	Grass Trigger-plant		X			
Typhaceae		*Typha orientalis*	Broadleaf Cumbungi				X	
Xanthorrhoeaceae		*Xanthorrhoea media*		X	X	X		

Appendix C

Fauna species list

Table C.1 Fauna species recorded within the subject land

Species Name	Common Name
Aves	
Acanthiza pusilla	Brown Thornbill
Cacatua galerita	Sulphur-crested Cockatoo
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Corvus coronoides	Australian Raven
Dacelo novaeguineae	Laughing Kookaburra
Dicaeum hirundinaceum	Mistletoebird
Eudynamys orientalis	Eastern Koel
Malurus cyaneus	Superb Fairy-wren
Pardalotus punctatus	Spotted Pardalote
Rhipidura albiscapa	Grey Fantail
Strepera graculina	Pied Currawong
Trichoglossus haematodus	Rainbow Lorikeet
Reptilia	
Lampropholis guichenoti	Pale-flecked Garden Sunskink
Mammlia	
Acrobates pygmaeus	Feathertail Glider
Perameles nasuta	Long-nosed Bandicoot

Appendix D

Tests of Significance

D.1 Duffys Forest Ecological Community

Duffys Forest Ecological Community (DFEC) is an open forest or woodland community which is found on ridgetops, upper slopes and plateaus. Soils are typically in association within shale lenses and lateritic soils. Dominant canopy species typically found are *Corymbia gummifera* (Red Bloodwood), *Eucalyptus sieberi* (Silvertop Ash), *Angophora costata* (Sydney Red Gum) and *E. capitellata or/E. oblonga* (Stringybark).

A total area of 0.08 ha of this community occurs in the north of the subject land, and is part of a patch that extends to the north within the study area (totalling 0.25 ha). The characteristic canopy species present within the subject land is *E. sieberi.* It is an open forest with some scattered native shrubs present either as juveniles regrowing from seed, or as coppiced regrowth from cut stumps.

Assessment of Significance

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

Not applicable.

b) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

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

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

The total area of DFEC present within the subject land is 0.08 ha. Of this, approximately 0.001 ha is proposed to be removed for the proposed building development footprint, as well as additional scattered trees for the APZ. The proposed action will result in an adverse effect on the extent of the ecological community as a minor portion of the community will be removed. The community currently exists in a partly fragmented and cleared form. The proposed action will not place the community at risk of extinction.

The proposed action will have no significant direct or indirect impacts on the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. The community occurs more extensively within the locality, including much of the length of Forest Way and Mona Vale Road north of the subject land.

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

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

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

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

Approximately 0.001 ha of DFEC plus additional scattered canopy is proposed to be removed for the proposed action.

The DFEC occurring within the subject land and immediate surrounds has previously been fragmented by various developments. Within this area, this community exists as a fragmented patch. The proposed development will fragment some areas of existing vegetation; however the proposed development predominantly requires clearing at the edge of treed habitat and will therefore encroach further into remaining habitat rather than creating fragmented habitat patches.

The community within the subject land has already been partly impacted by previous clearing of the understorey. The community has been partly modified, with some exotic species being present. Given the occurrence within a relatively small fragment, the area of habitat to be removed within the subject land is not considered to be important for the long-term survival of this community. Approximately half of the community will be retained on the subject land. DFEC occurs more extensively within the locality along Forest Way and Mona Vale Road north of the subject land.

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

There is no declared area of outstanding biodiversity value that occurs on the subject land or adjoining lands.

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

The proposal will constitute the key threatening process of “Clearing of native vegetation”. The understorey has already been partly cleared and additional canopy trees are proposed to be cleared.

Conclusion

The local occurrence of Duffys Forest Ecological Community on the subject land is comprised of a total of 0.08 ha. Approximately 0.001 ha of DFEC plus additional scattered canopy is proposed to be removed for the proposed development. The community has previously been impacted from clearing activity as scattered native shrubs are present either as juveniles regrowing from seed, or as coppiced regrowth from cut stumps.

The proposed development will not have a significant impact on DFEC and subsequently no BDAR is required. Approximately 0.001 ha of the community is proposed to be removed (plus a few canopy trees) of the 0.08 ha present on the subject land. Within the subject land, many of the shrub species are present either as juveniles regrowing from seed, or as coppiced regrowth from cut stumps from previous clearing activities. DFEC occurs more extensively within the locality along Forest Way and Mona Vale Road north of the subject land, generally in much better condition than in the subject land.

D.2 Threatened Flora – *Grevillea caleyi*

The occurrence of *Grevillea caleyi* is restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. All known natural remnant sites occur within a habitat that is both characteristic and consistent between sites. The species occurs on the ridgetop between elevations of 170 to 240m above sea level, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *E. gummifera*, and is commonly found in the endangered Duffys Forest Ecological Community (OEH, 2018).

Assessment of Significance

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

Grevillea caleyi is known to occur in the study area, within an unformed road easement to the north of the subject land. No known habitat will be removed, and the northern boundary of the subject land will be managed as part of an APZ, which acts as a buffer to the aged care development downslope. For these reasons, it is not expected that the proposed development will have an adverse impact on this species such that a local population will be placed at risk of extinction.

b) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

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

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

Not applicable.

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

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

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

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

No known habitat for *Grevillea caleyi* will be removed. Potential habitat, in the form of intact Duffy's Forest Ecological Community will predominantly be retained, but modified on the subject land, as part of management as an APZ. The APZ management will result in the possible removal of some canopy trees, but with retention of understorey vegetation, but with reduced fuel loads, through removal of litter and dense cover. However, the area of potential habitat to be modified is relatively small, when compared to the intact vegetation to the north and west, which is conserved and managed by Council.

The proposed development is within an existing cleared area, located at the western extent of the subject land. Potential habitat for the species occurs to the north and east, and will not be isolated or fragmented by the proposed development.

f) 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).

There is no declared area of outstanding biodiversity value that occurs on the subject land or adjoining lands.

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

The proposal will constitute the key threatening process of "Clearing of native vegetation". The understorey has already been partly cleared and additional canopy trees are proposed to be cleared. Additionally, there is potential for the key threatening process 'invasion of exotic perennial species' to be exacerbated by the proposed development. However, the impacts of these threats will be managed through the implementation of a BMP.

Conclusion

No individuals and no known area of habitat will be removed by the proposed development. Potential habitat, in the form of intact Duffy's Forest Ecological Community, will be retained on the subject land, although modified as part of an APZ. However, through active management of this potential habitat under a BMP, and retention of understorey vegetation (with reduced fuel loads), it is not considered that the proposed development will have a significant impact on *Grevillea caleyi* and subsequently no BDAR is required.

D.3 Threatened Fauna

This Assessment of Significance covers the following threatened fauna species with the potential to occur:

- Powerful Owl (*Ninox strenua*);

- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Little Bentwing-bat (*Miniopterus australis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*); and
- Southern Myotis (*Myotis macropus*).

Background

The Powerful Owl is distributed from Mackay to south western Victoria, mainly on the coastal side of the Great Dividing Range. This species occurs in many vegetation types from woodland and open sclerophyll to tall open wet forest and rainforest. It requires large tracts of native vegetation but can survive in fragmented landscapes. It roosts in dense vegetation and nests in large tree hollows. The Powerful Owl is listed as Vulnerable under the BC Act (OEH 2014b).

The Grey-headed Flying-fox is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It occurs as far west as the western slopes of the Great Dividing Range in northern NSW. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. They roost in large “camps” which are generally within 20 km of a food source. The Grey-headed Flying-fox is listed as Vulnerable under the BC Act and the EPBC Act (OEH 2015b).

The Eastern Freetail-bat is distributed along the east coast from southern QLD to southern NSW. The species inhabits dry sclerophyll forest and woodland east of the Great Dividing Range. It roosts singly and communally, mainly in tree hollows but will also roost under decorticating bark or in man-made structures. The Eastern Freetail-bat is listed as Vulnerable under the BC Act (OEH 2015a).

The Little Bentwing-bat is found from Cape York, Queensland to Wollongong, NSW along the east coast and ranges of Australia. They hunt in moist eucalypt forest, rainforest, vine thickets, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub along the east coast and ranges of Australia. Tree hollows are one of the many roosting habitats utilised by the Little Bentwing-bat. They also roost in caves, tunnels, abandoned mines, stormwater drains, culverts and bridges. The Little Bentwing-bat is listed as Vulnerable under the BC Act (OEH 2014a).

The Eastern Bentwing-bat is found along the east coast and 250 km inland of Australia. Caves are the primary roosting habitat for the Eastern Bentwing-bat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. They hunt in forested areas above the canopy. The Eastern Bentwing-bat is listed as Vulnerable under the BC Act (OEH 2016a).

The Greater Broad-nosed Bat occurs from the Atherton Tableland to north-eastern Victoria. It is found in various habitats being most commonly found in tall wet forest. Predominantly roosts in tree hollows but also roosts in buildings. The Greater Broad-nosed Bat flies approximately 3 to 6m above creek and river corridors (OEH 2016b). The species is listed as Vulnerable under the BC Act.

The Southern Myotis is found from the north-west through to western Victoria along the coast. It forages over pools and streams. The Southern Myotis roosts in groups of 10-15 close to water in caves, but can also roost in mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage (OEH 2015c). The species is listed as Vulnerable under the BC Act.

Assessment of Significance

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

The above listed species are likely to use the subject land as foraging habitat as part of a much larger foraging range. They are all highly mobile species that access resources from across a wide area and would not depend upon resources contained on the subject land for their survival. The proposal is not likely to place a viable local population of any of these species at risk of extinction due to the limited amount of foraging habitat present within the subject land.

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

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

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

Not applicable.

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

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

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

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

Approximately 0.32 ha of native vegetation will be cleared for the proposed development that provides potential habitat for these threatened fauna species. This represents a relatively small area of potential foraging habitat within the locality for these species. A larger area of foraging habitat occurs east of the subject land where intact native vegetation eventually joins Ku-ring-gai National Park. The subject land does not provide optimum foraging habitat for any of these species as they would tend to forage in more vegetated forests and woodlands within the wider locality. Larger areas of foraging habitat occur in Garigal National Park and Ku-ring-gai Chase National Park.

The proposal will not further fragment or isolate the potential habitat for these species. The native habitat proposed for removal is already relatively isolated as it has already been largely cleared. The subject land joins onto a large tract of vegetation which eventually connects to Ku-ring-gai Chase National Park.

The proposed action will not remove, modify, fragment or isolate important habitat. The proposal would remove only a small area of potential habitat for the species in relation to the habitat available within the locality. For this reason, clearance of habitat from the subject land is not considered significant in a local context as the subject land is likely to only provide minimal foraging habitat for these species. Habitat of greater significance is available in larger areas of bushland such as within Ku-ring-gai Chase National Park and Garigal National Park. These areas are more likely to provide roosting and foraging habitat for this species. It is therefore considered that the habitat provided on the subject land is not important for the long-term survival of the identified threatened species in the wider locality.

d) *Whether the action proposed is likely to have an adverse effect on any area of outstanding biodiversity value (either directly or indirectly).*

There is no declared area of outstanding biodiversity value that occurs on the subject land or adjoining lands.

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

The proposal's actions would constitute the key threatening process of "Clearing of native vegetation", as approximately 0.32 ha of native vegetation will be removed. As the vegetation to be removed on the subject land is highly modified by its current context being located within a residential area, it is considered that this vegetation constitutes marginal habitat. The majority of vegetation has already been cleared on the subject land. Therefore, the process of "Clearing of native vegetation" on the subject land is not likely to significantly affect these identified species.

Conclusion

Highly marginal foraging habitat will be removed within the subject land, however more optimum habitat exists in the wider locality. Any local populations of these species are unlikely to depend on the resources contained on the subject land for their survival and large areas of suitable habitat remain in the locality with much of that being in conservation reserves. Such reserves will remain in perpetuity and contain far higher habitat value than

the marginal habitat proposed to be removed from the subject land. Some marginal breeding habitat exists on the subject land. No significant impact is therefore considered likely to occur to these species and subsequently no BDAR is required.