

# Byles Creek Land Use and Environmental Constraints Assessment

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**Elton Consulting**

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Template 2.8.1

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## Abbreviations

Abbreviation	Description
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
CAA	Controlled Activity Approval
CEEC	Critically Endangered Ecological Community
DCP	Development Control Plan
DECC	Department of Environment and Climate Change (now DPIE)
DEEC	Department of Energy, Environment, and Conservation (now DAWE)
DAWE	Department of Agriculture, Water and the Environment
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd.

EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FFA	Flora and Fauna Assessment
FM Act	<i>Fisheries Management Act 1994</i>
KFH	Key Fish Habitat
KTP	Key Threatening Processes
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NSW	New South Wales
PW	Priority Weed listed under the <i>Biosecurity Act 2015</i>
PCT	Plant Community Type
OEH	Office of Environment and Heritage (now DPIE)
REF	Review of Environmental Factors
SIS	Species Impact Statement
SSDA	State Significant Development Application
TEC	Threatened Ecological Community
WM Act	<i>Water Management Act 2000</i>

# 1. Introduction

## 1.1. Purpose of the study

Hornsby Shire Council are undertaking a study to review the sustainability of planning controls in maintaining the environmental qualities of residential lands adjoining the open space zoned lands within the Byles Creek corridor. The study area is shown in Figure 1.

Eco Logical Australia were engaged to provide the following inputs to the review:

- *Identify and map the environmental constraints of residential lots by consideration of the following attributes:*
  - *Topography;*
  - *Proximity to watercourse;*
  - *Water quality;*
  - *Soil dispersibility;*
  - *Soil landscapes;*
  - *Plant communities;*
  - *Proximity to bushland;*
  - *Fauna habitat;*
  - *Threatened and endangered species and ecological communities in consultation with ecologist with appropriate skills;*
  - *Bushfire prone land by category;*
  - *Economic implications;*
  - *Infrastructure constraints; and*
- *Prepare analysis of these attributes ability for limiting development potential of residential zoned lots.*

## 1.2. Background

In 1995, the Byles Creek Catchment Environmental Study investigated approximately 350 hectares of land in the Byles Creek corridor, Beecroft. It found the Study Area had high environmental quality, aesthetic and heritage values and recommended that the Open Space zoning be retained on the publicly and privately-owned land.

Following this the Byles Creek Development Control Plan (DCP) was adopted in 1998. To protect the environmental values, development controls were introduced for setbacks, soil and water management based on soil type, environment protection, fencing, bushfire management, and development treatments relating to urban watercourse interface areas and land compatibility and sensitivity.

In 2006, an Open Space Review evaluated privately owned land zoned Open Space A to ensure that they met community needs and preserved environmental qualities. In the Byles Creek corridor, the Review recommended the retention of the open space zoning and acknowledged acquisition of privately-owned lots was required.

The Hornsby Development Control Plan 2013 was brought into effect and included the previous Byles Creek DCP area.

In August 2020, the Byles Creek Land Acquisition Strategy Review examined the strategic approach to land acquisition within the Byles Creek catchment to protect the ecological values of the corridor. It found the current RE1 zoning would protect its biodiversity values and ecosystem functionality and meets the objectives and terrestrial biodiversity provisions of the Hornsby Local Environmental Plan (LEP).



Figure 1: Location of the study area

## 2. Statutory Framework

Commonwealth and State legislation and policies, as well as local policies are relevant to the land use and environmental constraints assessment, planning the study area. A brief outline of the relevant Commonwealth and State Acts and Policies, and local policies, are provided below in Table 1.

**Table 1: Legislative context**

Name	Relevance to the project	Section in this report
Commonwealth		
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Matters of National Environmental Significance (MNES) have been identified as having a potential to occur within the locality. This report assesses the likelihood of occurrence of MNES within the site and assess potential impacts of the proposal on MNES.	Sections 9 and 10, Appendix 1
NSW		
<i>Environmental Planning and Assessment Act 1979</i> (EP&A Act)	The EP&A Act is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of planning and development proposals. The planning study is prepared under Part 3 of the EP& Act 1979.	N/A
<i>Biodiversity Conservation Act 2016</i> (BC Act)	The BC Act governs the listing of threatened species, populations and ecological communities. It contains the principles to avoid, minimise and offsets impacts on biodiversity. For developments under Part 4 of the EP&A Act, a Biodiversity Development Assessment Report (BDAR) or BDAR waiver may be required.	Sections 7, 8, 9 and 10
<i>Biosecurity Act 2015</i>	Under the <i>Biosecurity Act 2015</i> , priority weeds have been identified for local government areas and assigned strategies to contain, remove or manage. Occupiers of land (this includes owners of land) have responsibility for taking appropriate action for priority weeds on the land they occupy. Priority weeds listed under the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (updated 2019) are relevant to study area	Sections 6 and 7
<i>Water Management Act 2000</i> (WM Act)	The Study Area contains watercourses mapped on the <i>Water Management (General) Regulation 2018</i> hydroline spatial data. Waterfront land is defined as within 40 m from the top of bank of these watercourses and any development on waterfront land is considered a Controlled Activity, requiring a Controlled Activity Approval (CAA) under s91 of the WM Act. However, under Clause 29 of Schedule 4 of the <i>Water Management (General) Regulation 2018</i> , any kind of controlled activity carried out in connection with development for a dwelling house or dual occupancy building that does not involve works in or on the bed of any channel is exempt from requiring a CAA.	Section 4
<i>Fisheries Management Act 1994</i> (FM Act)	The FM Act governs the management of fish and their habitat in NSW. The Schedules of the Act list key threatening processes and threatened species. The FM Act regulates the provision of permits required in relation to harm to protected marine vegetation (seagrass, macroalgae, mangroves and saltmarsh), dredging, reclamation or obstruction of fish passage on or adjacent to Key Fish Habitat (KFH). This includes direct and indirect impacts, whether temporary or permanent.  The third order reach of Byles Creek is mapped as KFH by DPI Fisheries.	Section 4

Name	Relevance to the project	Section in this report
Rural Fires Act	The RF Act is integrated into the EP&A Act and triggered by Section 4.46 of the EP&A Act.	Section 11
Planning Instruments		
<i>Hornsby Environmental (2013)</i>	<i>Local Plan</i> The study area is mapped as RE1 and R2 under the Hornsby Local Environmental Plan (LEP) 2013. Hornsby LEP contains provisions and mapping relating to biodiversity, under Section 6.4 of the LEP and the Terrestrial Biodiversity Map.	N/A

## 3. Topography

### 3.1. Methodology

Slope data provided by Hornsby Shire Council and includes the following:

- 20cm DEM raster file
- 20cm DSM raster file
- 20cm Slope raster file).

Figure 2 shows the 20cm slope raster file classified into groups of 5° increments from 0° to 45 and then measurements exceeding 45°.

### 3.2. Slope Maps

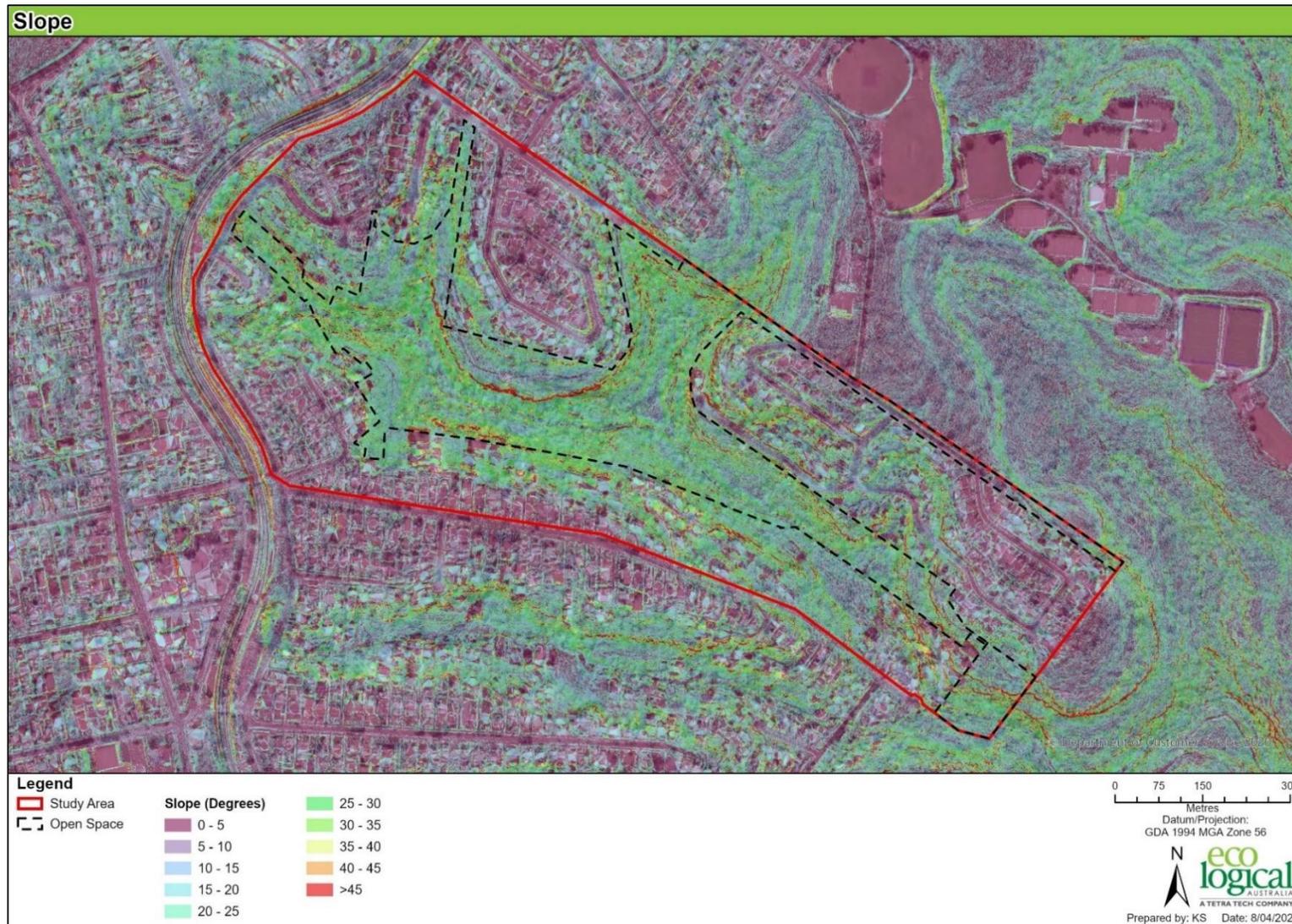


Figure 2: Slope map classified in increments

### 3.3. Results and Discussion

The topography of study area ranges from flat in mainly residential areas to very steep along ridge lines. Tributaries of Byles Creek begin in the north west and central north and meet in the centre of the study area. The riparian areas surrounding Byles Creek and its tributaries comprise of majority vegetated bushland with some riparian areas located along the urban interface in the northwest.

Land zoned as public open space extends over steeply sloped terrain, whilst existing residential locations are generally situated in areas where topography is more suitable for development. Steep slopes exceeding 45° around the ridge lines are evident along contours of greatest elevation sloping down towards streamlines.

Increased risks associated with slope included greater bushfire, erosional, landslip and flood risk. Slope assessments are a critical component in determining bushfire risk. The NSW Rural Fire Service Planning for Bush Fire Protection (2019) provides the framework for assessing bush fire risk. Slopes greater than 18° are difficult to maintain subsequently reducing effectiveness of an asset protection zone and therefore are not recommended for such a use. Bushfire constraints are discussed in further detail in the Bushfire section of this report.

The soils landscapes are Hawkesbury, Glenorie, Lucas Heights and West Pennant Hills and are discussed in more detail in the Soil Landscapes section. The predominate soil landscape at Byles Creek is Hawkesbury and is described as rugged, rolling to very steep hills of Hawkesbury sandstone, this soil landscape makes up approximately 65% of the study area. The limitations associated with the Hawkesbury soil landscape are mass movement hazard, rockfall hazard, steep slopes, server erosional hazard, rock outcrop and shallow soil; and is not generally not capable for urban development. The Hawkesbury soil landscape makes up 90% of the Open Space area.

As a result of the topography and soil landscape within the Byles Creek study area, and in particular on land designated as Open Space,–urban development would likely be constrained without extensive earthworks and stabilising mechanisms due to steep slopes and associated risks.

## 4. Watercourse Assessment

### 4.1. Methodology

#### 4.1.1. Literature and database review

A review of the following relevant data, background literature on the study area and locality, and relevant planning instruments and strategic documents was undertaken:

- *Water Management (General) Regulation 2018* Hydroline spatial dataset
- Fisheries Spatial Portal and threatened species distribution maps (Riches et al, 2016).

#### 4.1.2. Site inspection

A site inspection was completed by ELA Aquatic Ecologist Claire Wheeler on 31 March 2021. Rainfall had fallen in the catchment within the previous week.

The study area was traversed on foot and the survey focused on identifying the condition of the watercourses within the study area, including instream habitat, riparian vegetation and a visual assessment of water quality. Notes and photographs were taken during the site inspection.

## 4.2. Watercourse maps



Figure 3: Watercourses and their Strahler classifications within the study area



Figure 4: Recommended riparian corridor widths and mapped key fish habitat

### 4.3. Results and Discussion

Within the study area there are seven watercourses that are all tributaries of Byles Creek. Four first order, two second order and one third order creeks were mapped within the study area boundary (Figure 3). These watercourses and their riparian zones varied in condition, likely as a result of their position in the catchment.

At one of the upstream extents of the study area, the first order tributary below Azalea Grove was a steeply sloping, bedrock-controlled watercourse at the bottom of a steep gully (Figure 5 and Figure 6). The vegetation along the road edges above the creek was predominantly exotic, comprised of *Ligustrum lucidum*, *Ligustrum sinense* and *Senna pendula*. However, at the bottom of the gully along the creekline, the vegetation was predominantly native.

Below Angophora Place, Byles Creek was in very good condition, with very few exotic species observed and a variety of instream habitats were present, including riffles, runs and pools (Figure 7 and Figure 8). Water clarity was generally good, with the water slightly turbid most likely due to rainfall received in the prior days.

Byles Creek behind the lower end of Malton Road was still a bedrock controlled channel, however the riparian vegetation was predominantly exotic (Figure 9 and Figure 10), with canopy trees smothered in *Cardiospermum grandiflorum* (Balloon Vine) and *Setaria palmifolia* (Palm Grass) and *Ageratina riparia* (Mistflower). The vegetated riparian zone in this area was narrow, with residential properties located relatively close to the watercourse.

Overall, Byles Creek and its tributaries were in good condition within the study area. Little erosion was observed along the creekline and little accumulated sediment was noted in the channels. The edge effect of urban development alongside lower reaches of Byles Creek was evident, in that where properties were in close proximity to the watercourse itself, the creek was fringed by predominantly exotic species. The riparian vegetation adjacent to the Byles Creek tributary below the eastern end of Azalea Grove was in good condition, although the vegetation along the road edges and property boundaries was in poor condition and dominated by exotic shrubs and vines.

These observations highlight the importance of maintaining a vegetated buffer between residential development and watercourses within Byles Creek catchment. The Natural Resources Access Regulator (NRAR) recommends riparian corridor widths based on Strahler order of watercourses. These have been mapped for Byles Creek in Figure 4.

While the need for a Controlled Activity Approval (CAA) is not applicable for single dwelling and dual occupancies (see Table 1), the principles of the *Guidelines for controlled activities on waterfront land* (NRAR, 2018) should still be applied in order to protect the Byles Creek catchment. This includes maintaining vegetated buffers between future residential developments and Byles Creek.



**Figure 5: Byles Creek tributary near end of Azalea Grove, looking upstream**



**Figure 6: Byles Creek tributary near end of Azalea Grove, looking downstream**



**Figure 7: Byles Creek below Angophora Place, looking upstream**



**Figure 8: Byles Creek below Angophora Place, looking downstream**



**Figure 9: Third order Byles Creek behind Malton Road, looking upstream**



**Figure 10: Third order Byles Creek behind Malton Road, looking downstream**

## 5. Water Quality Analysis

### 5.1. Methodology

Water quality data from Hornsby Shire Council's water quality monitoring program was reviewed to determine the likely water quality of the Byles Creek study area and compare the water quality of the study area with nearby catchments with similar characteristics.

Observations of water quality and potential point source and non-point source pollution sources were also noted during the site inspection on 31 March 2021.

### 5.2. Results and Discussion

Hornsby Council does not have an existing water quality monitoring point within the study area, however there is a water quality monitoring point known as Site 147, located downstream of the study area on a tributary of Byles Creek within Lane Cove National Park.

Data from this site was compared with data collected at Georges Creek and Pyes Creek sites, which are sites representative of waterways influenced primarily by urban land-use. The average Total Nitrogen at Pyes Creek from January 1995 to September 2017 was 0.926 mg/L and for the same period at Georges Creek was 0.743 mg/L. In comparison, at Site 147, the average Total Nitrogen level between December 2010 and September 2020 was 0.166 mg/L.

Faecal coliform levels at Georges Creek were on average 8504 CFU/100ml and 2283 CFU/100ml at Pyes Creek. In comparison, the level at Site 147 was 140 CFU/100ml.

From these comparisons it could be inferred that the greater amount of urban development in the Georges and Pyes Creek catchments has contributed to the poor water quality at these sites, and that future development within the Byles Creek catchment may lead to the same degradation of water quality.

It was also noted that sources of pollution and additional nutrients were observed during the site inspection and are shown in Figure 11, Figure 12 and Figure 13. Regular maintenance of GPT's and street sweeping regimes could prevent these items from entering the waterways.



**Figure 11: Full gross pollutant trap below Britannia Street**



**Figure 12: Leaf litter entering stormwater drain on Malton Road**



**Figure 13: Litter deposited in riparian zone of Byles Creek below Angophora Place**

## 6. Soil Landscapes

### 6.1. Methodology

A review of DPIE's eSpade website was undertaken to determine the soil landscapes present within the study area.

## 6.2. Soil landscape Map

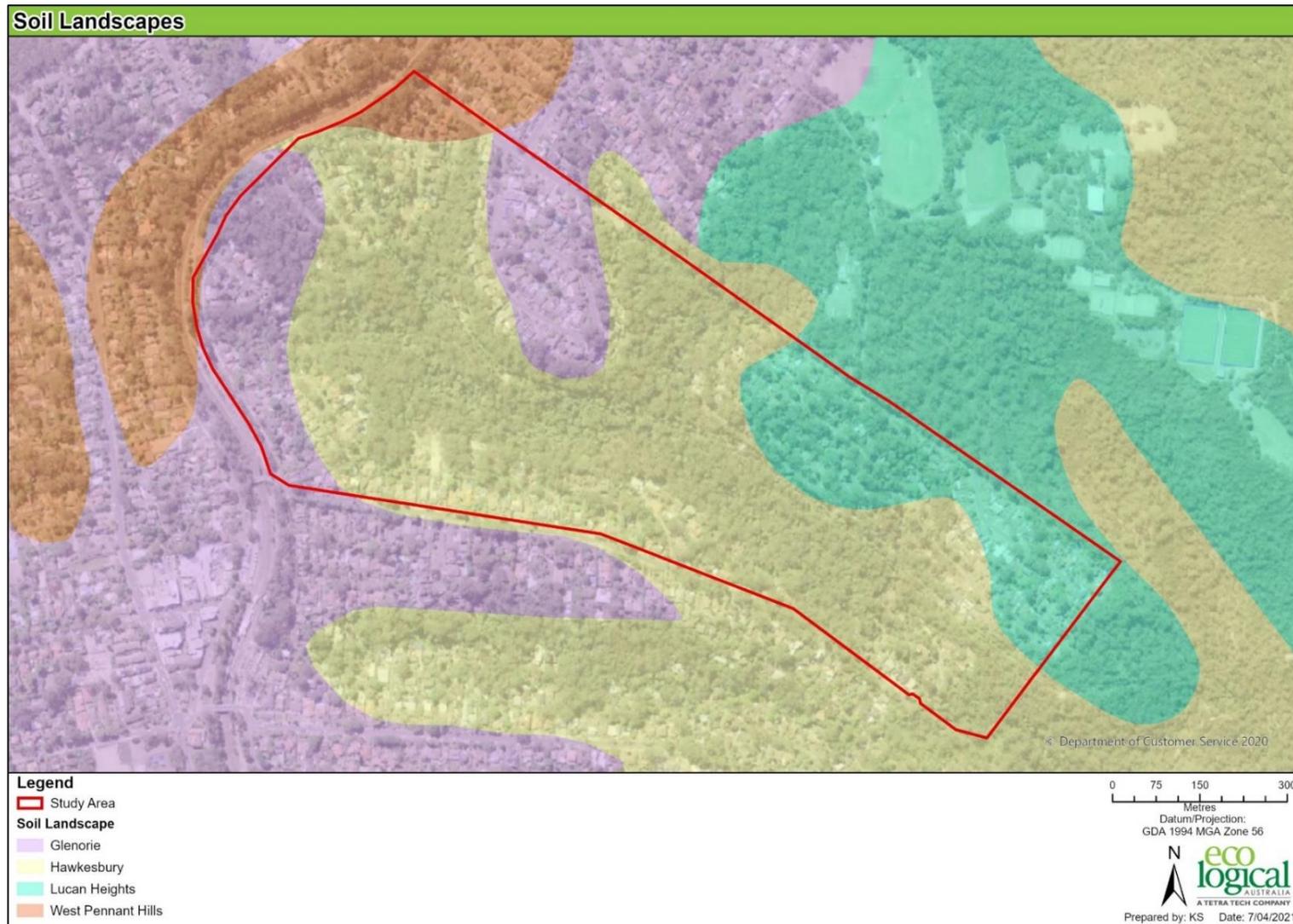


Figure 14: Soil landscapes within the study area

### 6.3. Results and Discussion

The soil landscapes identified within the study area are shown in Figure 14 and a description of each of these is included in Table 2. This is an extract from Chapman G.A. and Murphy C.L., 1989, *Soil Landscapes of the Sydney 1:100,000 Sheet* report, Soil Conservation Service of NSW, Sydney. A soil landscape is an area of land with a common suite of soil types and landscape attributes. Soil landscape mapping also provides an overview of soil and/or landscape limitations for land use practices, and an assessment of both urban and rural land capabilities.

**Table 2: Soil landscapes within study area**

Landscape	Geology	Soils	Erosion Hazard
<b>Hawkesbury-Colluvial</b>			
Rugged, rolling to very steep hills on Hawkesbury Sandstone. Local relief 40–200 m, slopes >25%. Rock outcrop >50%. Narrow crests and ridges, narrow incised valleys, steep sideslopes with rocky benches, broken scarps and boulders. Mostly uncleared eucalypt open woodland (dry sclerophyll forest) and tall open-forest (wet sclerophyll forest).	Hawkesbury Sandstone consisting of medium to coarse-grained quartz sandstone with minor shale and laminite lenses. Sandstones are either massive or cross-bedded sheet facies with vertical or subvertical joint sets. The combination of bedding planes and widely spaced joints gives sandstone outcrops a distinctive blocky appearance.	Colour varies from brownish-black when abundant organic matter is present, to dull yellow orange. Colour often becomes lighter with depth. The pH ranges from strongly acid (pH 4.0) to slightly acid (pH 6.0). Weakly weathered sandstone fragments may be present whilst charcoal fragments and roots are common. This material is commonly water repellent.	Erosion hazard for non-concentrated flows is generally very high and ranges from moderate to extreme. The calculated soil loss for the first twelve months of urban development ranges up to 109 t/ha for topsoil and 394 t/ha for subsoil. The soil erosion hazard for concentrated flows is extreme.
<b>Lucas Heights – Residual</b>			
gently undulating crests and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). Local relief to 30 m, slopes	Mittagong Formation—interbedded shale, laminite and fine to medium grained quartz sandstone. The Mittagong Formation is located stratigraphically between the Ashfield Shale and Hawkesbury Sandstone. It is often relatively shallow. Minor areas of Hawkesbury Sandstone and minor areas of Ashfield Shale may occur.	Moderately deep (50–150 cm), hardsetting Yellow Podzolic Soils and Yellow Soloths (Dy2.41); Yellow Earths (Gn2.24) on outer edges.	The erosion hazard for non-concentrated flows is generally moderate, but ranges from slight to extreme. Calculated soil loss during the first twelve months of development ranges up to 103 t/ha for topsoil, and 97 t/ha for exposed subsoil. Soil erosion hazard for concentrated flows is high.
<b>Glenorie - Erosional</b>			
Undulating to rolling low hills on Wianamatta Group shales. Local relief 50–80 m, slopes 5–20%. Narrow ridges, hillcrests and valleys. Extensively cleared tall open-forest (wet sclerophyll forests).	This soil landscape is underlain by Wianamatta Group Ashfield Shale and Bringelly Shale formations. The Ashfield Shale is comprised of laminite and dark grey shale. Bringelly Shale consists of shale, calcareous claystone,	Shallow to moderately deep (<100 cm) Red Podzolic Soils (Dr2.11) on crests; moderately deep (70–150 cm) Red and Brown Podzolic Soils (Dr2.11, Dr2.21, Db1.11, Db1.21) on upper slopes;	The erosion hazard for non-concentrated flows ranges from moderate to very high. Calculated soil loss for the first twelve months of urban development ranges up to 65 t/ha for topsoil and 117 t/ha for exposed subsoil.

Landscape	Geology	Soils	Erosion Hazard
	laminite, fine to medium grained lithic-quartz sandstone	deep (>200 cm) Yellow Podzolic Soils (Dy5.11) and Gleyed Podzolic Soils (Dg4.11) along drainage lines.	The soil erosion hazard for concentrated flows is high.
West Pennant Hills - Colluvial			
rolling to steep sideslopes on Wianamatta Group shales and shale colluvium. Local relief 40–100 m, slopes >20%. Partially cleared, tall, open-forest (wet sclerophyll).	Wianamatta Group. Ashfield Shale formation-laminite and dark grey shale. Bringelly Shale-shale, calcareous claystone, laminite, fine to medium grained lithic quartz sandstone (Herbert, 1983).	deep (>200 cm) Red and Brown Podzolic Soils (Dr2.11, Dr3.11, Db1.11) on upper and midslopes; Yellow and Brown Podzolic Soils My 4.11, Dy5.11, Db1.11) on colluvial benches; Yellow Podzolic Soils (Dy3.11) and Gleyed Podzolic Soils (Dg4.11) in drainage lines and poorly drained areas.	Because slopes are steep the erosion hazard for non-concentrated flows is high to extreme. Calculated soil loss for the first twelve months of urban development ranges up to 219 t/ha of topsoil and 372 t/ha for exposed subsoil. The erosion hazard for concentrated flows is very high to extreme.

Soil landscape summaries for the study area identify that the erosion hazards for non-concentrated flows range from moderate to very high and for concentrated flows from high to extreme. This has constraints on future development in regard to stormwater disposal off site, discharged towards Byles Creek and its tributaries, which has the potential to easily erode the slopes leading down to the watercourses at the bottom of the gullies. Erosion of the slopes above the watercourses can lead to sedimentation and degradation of water quality within downstream environments including Lane Cove National Park.

## 7. Ecological Assessment

### 7.1. Methodology

#### 7.1.1. Literature and database review

A review of the following relevant data, background literature on the study area and locality, and relevant planning instruments and strategic documents was undertaken:

- Aerial photographs (Google Earth, SIXMaps)
- Atlas of NSW Wildlife (Department of Planning, Industry and Environment (DPIE) 2021)
- Biodiversity Values Map (NSW Government) (Accessed 21 March 2021)
- Commonwealth EPBC Act Protected Matters Search Tool (DAWE 2021)
- Threatened species profiles (OEH 2021)
- Hornsby Local Environment Plan 2013 (LEP 2013)
- Hornsby Development Control Plan 2012 (DCP 2013)
- Hornsby Council Natural Heritage Register (LEP 2013)
- Office of Environment and Heritage (OEH – now DPIE) Sydney Metro mapping (2016)
- Native Vegetation Communities of the Hornsby Shire and Mapping (Smith and Smith 2008, ELA 2018)
- Soil Landscapes of Sydney 1:100 000 Sheet (Chapman and Murphy 1989).

The BioNet database (5 km radius) and Protected Matters Search Tool (5 km radius) searches were performed around the coordinates -33.7466, 151.0732 on 7 April 2021. The results of these searches were combined to produce a list of threatened species, populations and ecological communities considered likely to occur in, or utilise the study area. The likelihood of occurrence for each species, population and ecological community was determined using recent records, the likely presence of suitable habitat and knowledge of the species ecology.

The likely occurrence of each species was determined before the site inspection by reviewing records in the area, considering the habitat available and using expert knowledge on the ecology of each species. This was then reviewed and refined following the site inspection. The likelihood of occurrence for each species determined after the site inspection is provided in Appendix A.

Five terms for the likelihood of occurrence of species are used in this report, as defined below:

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

### 7.1.2. Site Inspection

A site inspection was conducted by ELA ecologist Stacey Wilson on 31 March 2021. The weather conditions on this day were sunny with no winds with a maximum temperature of 24.3°C, minimum temperature of 13°C and no rainfall recorded (Weather Station 66124, BOM 2021).

The study area was traversed on foot and the survey focused on the following:

- Validate the extent and quality of vegetation within the study area and assignment to a best-fit Plant Community Type (PCT) in accordance with the NSW Government BioNet Vegetation Classification
- Identify the presence of threatened species/populations or whether potential habitat for these species/populations were likely to occur
- Identify any other significant habitat features such as hollow bearing trees, riparian areas and rocky outcrops.

Notes and photographs were taken during the site inspection.

### 7.1.3. Vegetation Communities

The random meander method (Cropper 1993) was used to confirm the boundaries of vegetation communities and species assemblages within the study area. Where the boundaries of vegetation communities differed from existing vegetation mapping, these were modified on hard copy maps and marked with a hand-held GPS.

### 7.1.4. Flora surveys

Preliminary flora surveys were conducted simultaneously while validating the vegetation communities. A list of potential threatened flora species likely to occur was identified during literature review. Field surveys focused on suitable habitat for threatened flora species. A list of opportunistic observations was also recorded.

### 7.1.5. Fauna Surveys

The presence of threatened fauna species identified as having the potential to occur in the study area was determined through a habitat assessment. Where threatened species or important habitat features were observed, their locations were marked using a hand-held GPS. However, the locations of important habitat features (e.g. rock outcrops, significant logs and location of all winter flowering eucalypts) observed were not recorded, but rather a qualitative assessment was conducted for each feature was conducted.

This assessment was not intended to provide an inventory of all species present across the study area but instead an overall assessment of the ecological values of the study area with a particular emphasis on threatened species, TECs and key fauna habitat features. It is important to note that some species may not have been detected on the site during the inspection as they may be cryptic or seasonal and only detectable during flowering or during breeding. In this case the likelihood of their occurrence on site has been assessed based on the presence of potential habitat.

## 7.2. Results and Discussion

### 7.2.1. Vegetation Communities

There were three vegetation communities present within Byles Creek. These include:

- Blue Gum Shale Forest
- Blackbutt Gully Forest
- Coachwood Rainforest.

The vegetation community naming in this report follows nomenclature in the Native Vegetation Communities in the Hornsby Shire (Smith and Smith 2008), and have been assigned to a Plant Community Type (PCT) shown in Table 3. Remnant tree canopy species were also present in front and back yards of private properties and are contain both remnant urban trees and plantings. Vegetation is shown in Figure 15 and Figure 16.

**Table 3: Vegetation communities and Plant Community Types**

Hornsby Vegetation Communities	Plant Community Types
Blue Gum Shale Forest	1237. Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion
Blackbutt Gully Forest	1181. Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion
Coachwood Rainforest	905. Lilly Pilly - Coachwood warm temperate rainforest on moist sheltered slopes and gullies, Sydney Basin Bioregion and South East Corner Bioregion

#### 7.2.1.1. Blue Gum Shale Forest

At the north western end of the study area small areas of Blue Gum Shale Forest was present. The dominant canopy was *Eucalyptus saligna* (Blue Gum), with occasional *Angophora costata* (Sydney Red Gum) and *Eucalyptus paniculata* (Grey Ironbark). Understorey included small trees *Allocasuarina torulosa* (Forest Oak), with ground layer of *Adiantum aethiopicum*, *Lomandra longifolia* and *Plectranthus parviflorus*. Some examples of this community were present as remnant trees with little native undertorey.

#### 7.2.1.2. Blackbutt Gully Forest

The majority of the study area was vegetated by Blackbutt Gully Forest with the dominant canopy species included *Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Smooth-barked Apple), *Syncarpia glomulifera* (Turpentine) and *Corymbia gummifera* (Red Bloodwood). Understorey included shrubs of *Banksia spinulosa*, *Xanthorrhoea arborea*, *Persoonia linearis*.

#### 7.2.1.3. Coachwood Rainforest

Two areas within the creekline were vegetated by Coachwood Rainforest with dominant canopy of *Ceratopetalum apetalum*. Understorey included small trees of *Tristaniopsis laurina*, *Callicoma serratifolia*, sedges including *Gahnia clarkei*, ferns such as *Blechnum ambiguum*, *Sticherus flabellatus*, and vines including *Cissus hypoglauca*, *Morinda jasminoides* and *Smilax glycyphylla*. Weeds included *Ligustrum sinense* and *Ageratina riparia*.

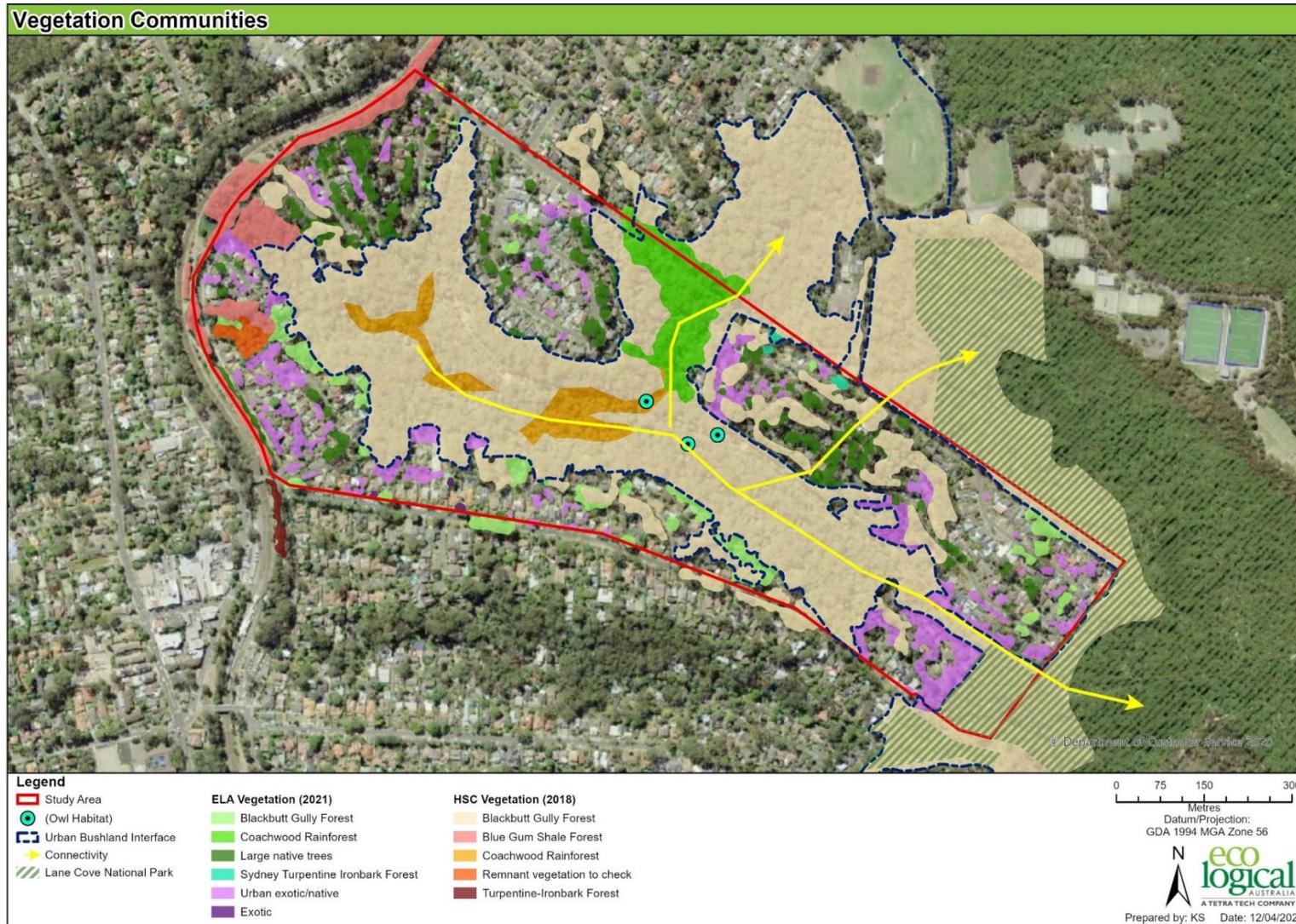


Figure 15: Vegetation communities, urban bushland interface and urban trees

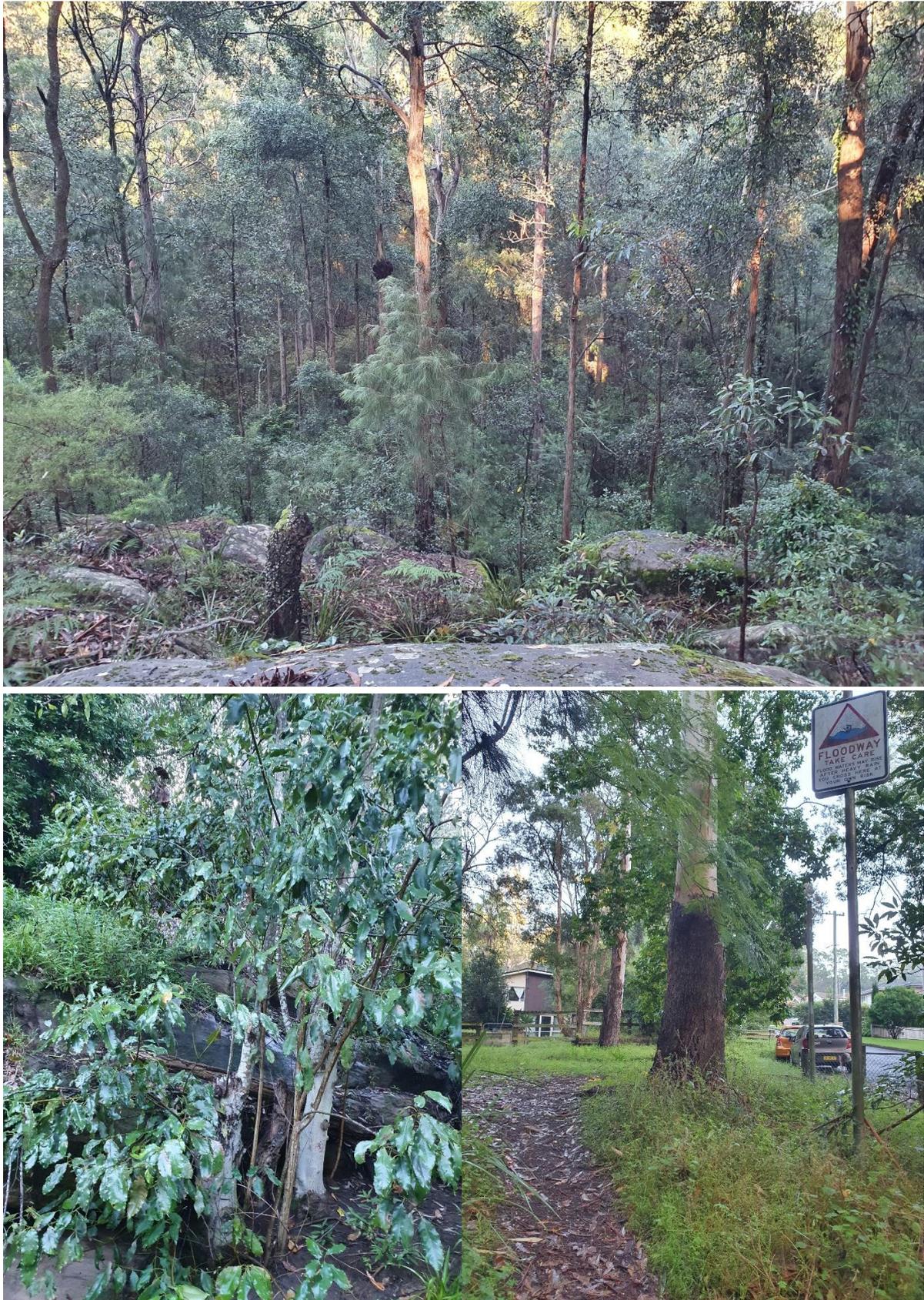


Figure 16: Blackbutt Gully Forest, Coachwood Rainforest and Blue Gum Shale Forest

### 7.2.2. Bushland Proximity

The study area has good connectivity to large areas of native vegetation in Lane Cove National Park being located immediately adjacent. The study area also has good connectivity to nearby Council managed bushland reserves in Britannia Street, Pennant Hills, and to the National Trust property ‘Ahimsa’ in Day Road, Cheltenham.

The interface between the urban and bushland areas has been mapped as shown in Figure 15. The interface is defined by mapping vegetation communities within the bushland area, and mapping remnant trees within the urban area.

### 7.2.3. Fauna species and habitats

Vegetation within the study area provides suitable habitat for a number of common peri-urban species and threatened fauna species. Habitat features were recorded within the study area and have been described below.

**Table 4: Habitat features and associated fauna groups (guilds) recorded within the study area**

Habitat Features	Guild	Presence in study area
Remnant vegetation	Birds, microchiropteran bats (microbats), megachiropteran bats (fruit bats), arboreal mammals, reptiles	Present and extensive within Byles Creek corridor. Remnant canopy also present within private properties.
Winter flowering species	Winter migratory birds, arboreal mammals and megachiropteran bats (fruit bats)	Limited.
Hollow-bearing trees (HBT)	Birds and arboreal mammals (gliders and microbats)	Present, and ranging in size from small hollows able to support smaller species such as microbats to larger hollow dependant species such as owls.
Stags	Birds, particularly birds of prey, reptiles, amphibians, micro bats	Present and likely to provide habitat for larger hollow dependant species such as owls.
Leaf litter	Reptiles, amphibians, invertebrates	Abundant. Deep leaf litter is present across a large portion of the study area within Byles Creek corridor.  Limited leaf litter within urban areas.
Coarse woody debris	Terrestrial mammals, reptiles, invertebrates	Present, logs present within Byles Creek corridor.
Watercourses	Amphibians, reptiles, water birds and microbats	Present – ephemeral streams, 1 <sup>st</sup> 2 <sup>nd</sup> and 3 <sup>rd</sup> order Strahler streams present within study area and is suitable habitat for threatened amphibian species.
Rocks/ rocky outcrops	Reptiles, invertebrates, terrestrial mammals	Abundant – rocky sandstone outcropping and large rocks abundant within Byles Creek corridor.
Vegetative corridor	Birds, reptiles, arboreal and small mammals	Present and extensive within Byles Creek corridor. Remnant canopy also present in front and back of private property. Canopy vegetation contains good connectivity through planted native and

Habitat Features	Guild	Presence in study area
		exotic canopy species within private property.
Mistletoe	Birds and arboreal mammals	Absent
Native/ Exotic grassland	Migratory wetland birds (Egrets), predator bird species (Little Eagle) and microbats	Limited

#### 7.2.3.1. Hollow bearing trees

Hollow-bearing trees (HBTs) and stags are present and ranging in size from small hollows able to support smaller species such as non-threatened and threatened microbats to larger hollow dependant species such as owls and arboreal mammals.

#### 7.2.3.2. Birds

Remnant and planted trees typically provide foraging, roosting and perching habitat for a number of larger bird species. HBT's provide roosting habitat for hollow-dependant bird species and are often in limited supply in fragmented habitats. Within the Byles Creek corridor there is an abundance of hollows in varying sizes. A number of large sized hollows, which could support threatened owls were noted within the study area.

#### 7.2.3.3. Arboreal Mammals (Not including bats)

There is an abundance of nectar producing Eucalyptus and Banksia species present within the study area. The nectar producing species are suitable foraging habitat for non-threatened arboreal mammal species such as *Pseudocheirus peregrinus* (Common Ringtail Possum) and *Trichosurus vulpecula* (Common Brushtail Possum).

#### 7.2.3.4. Bats (Microchiropteran Bats and Megabats)

Threatened and non-threatened tree-roosting microbats may utilise small hollows in trees for temporary diurnal shelter, and potentially as roosting habitat, although there were no obvious potential roost sites identified during the field survey. A detailed survey would be required identify potential roosting sites for microbats.

#### 7.2.3.5. Reptiles

Fallen logs and rocks which provide basking habitat for reptile species were abundant within the study area. No BioNet Wildlife Atlas records for threatened reptiles have been recorded within 5 km of the study area.

#### 7.2.3.6. Amphibians

The study area contains ephemeral streams, 1<sup>st</sup> 2<sup>nd</sup> and 3<sup>rd</sup> order Strahler streams within the study area. Deep leaf litter and rocks are present along the banks of the streams. The streams are suitable habitat for amphibians including threatened species.

## 7.2.4. Threatened species, endangered populations and ecological communities

### 7.2.4.1. Threatened flora

The vegetation within the Byles Creek corridor contains suitable habitat for 30 threatened flora species identified by BioNet Wildlife Atlas records within a 5 km radius of the study area. There are several records of threatened flora species within or in close proximity to the study area including:

- *Darwinia biflora*
- *Genoplesium baueri*
- *Leptospermum deanei*
- *Tetratheca glandulosa*.

### 7.2.4.2. Threatened fauna

The Byles Creek corridor contains suitable habitat for 30 threatened fauna species identified by BioNet Wildlife Atlas records within a 5 km radius of the study area. There are several records of threatened fauna species within or near the study area including:

- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Ninox strenua* (Powerful Owl)
- *Pseudophryne australis* (Red-crowned Toadlet)
- *Pteropus poliocephalus* (Grey-headed Flying-fox).

### 7.2.4.3. Endangered population

The Byles Creek corridor contains habitat for the listed Gang-gang Cockatoo endangered population in the Hornsby and Ku-ring-gai Local Government Areas.

### 7.2.4.4. Threatened ecological communities

Blue Gum High Forest in the Sydney Basin Bioregion is listed as Critically Endangered in NSW under the BC Act and in Australia under the EPBC Act. The Byles Creek study area does not meet the condition criteria under the EPBC Act as the area is too small.

## 7.2.5. Habitat Requirements.

### 7.2.5.1. Powerful Owl

BioNet records over 1000 sightings of *Ninox strenua* within a 5 km radius of Byles Creek since the 1980s. The species can breed and forage in very small patches of vegetation, although this is hugely variable across their range. They require nest trees in living or dead trees with hollows greater than 20 cm diameter. To ensure protection a circular buffer with a 100 m radius around the known nest tree/s m forms a polygon for the species protection for Development Applications or Biodiversity Stewardship sites within the area essential for breeding, and includes habitat suitable for male roosts, feeding/grooming perches and fledgling requirements. This is in addition to foraging habitat (Threatened Biodiversity Database Collection (TBDC), EES 2021).

There is competition for urban tree hollows due to their scarcity, with Sulphur-crested Cockatoos taking over owl nesting hollows within one day of a failed breeding (Birdlife Australia, Sydney Powerful Owl Project (POP) 2020). Retention of hollow-bearing trees is critically important to the species survival in urban areas. They also found a high mortality of young fledglings, coupled with the increase in single

chick fledglings, impacting on recruitment of young into the population. The project also recorded 75% of the mortalities of adult birds in 2019 was due to roadkill. They discuss the selective removal of large and small hollow-bearing trees from the urban space, often without any assessment of how important these hollows are to urban wildlife, because they are considered “ugly” or dangerous. This is compounded by significant hollow-loss following the NSW 2109/2020 fires.

The POP is investigating effective artificial hollows to promote the survival of urban Powerful Owls in areas where hollows have been lost, through trials measuring temperature and humidity in known owl nest trees and in insulated nest boxes, to allow for successful egg development. Initial results suggest that with correct design, artificial nest boxes can act thermally like natural tree hollows.

The project has also focused on corridors for dispersing juvenile owls, where they can move through existing territories until they can establish a territory, using conservation genetics to monitor movement through citizen scientists undertaking monitoring during March to May.

Other human activities that impact on Powerful Owl include the use of second generation rodenticides where they eat rats and mice that have ingested poison, as well as human visitors near nest sites causing the loss of fledglings.

#### 7.2.5.2. Gang-gang Cockatoo

In 2001 the population was listed as endangered by the NSW Scientific Committee which found that the numbers of the Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas have been reduced to such a critical level, and its habitat has been so drastically reduced, that it is in immediate danger of extinction. The small population was the last known breeding population in the Sydney Metropolitan area, estimated at that time to be between 18 - 40 pairs.

BioNet Atlas numbers reveal a drastic population decline since 2010, with annual sighting numbers of individuals ranging from 40-126 from 1980-2009, and to 2-3 since 2010. (Figure 17).

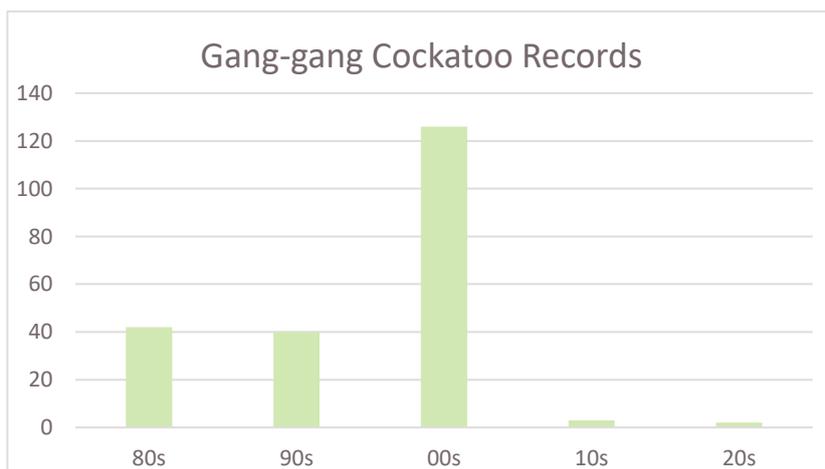


Figure 17: Gang-gang Cockatoo records within 5 km of Byles Creek

The species and population is dependent on the retention of potential nest trees which are forest and woodland eucalypts containing hollows that are at least 9 m above the ground; and contain hollows with a diameter of 10 cm or larger. A species polygon for a breeding pair includes a buffer with a radius of 200 m around each nest tree, being the essential area for breeding and minimise disturbance/avoid

clearing for a development application, or conserve and improve habitat for a biodiversity stewardship agreement. This may be a linear shape if the vegetation is linear, and the nest tree is already located near the edge of the wooded area (TBDC, EES 2021). The high level of biodiversity concern includes that as a species dependent on habitat attributes, has a high sensitivity to loss and a high sensitivity to gain.

Saving our Species program (OEH, 2021) currently has no key management sites for conservation of the endangered population. It recommends the following actions:

- Develop fire management options within forested habitat areas that give priority to minimising loss of habitat trees
- Produce a community awareness strategy that provides advice on how to carry out actions that will benefit the population of the species
- Provide supplementary hollows/nest boxes within the primary habitat areas
- Develop a strategy that includes street tree or other planting, browse plant species within reserves and private residences
- Monitor utilisation of the relevant forested areas as to nesting, foraging and other habitat uses
- Investigate movement patterns within and between areas occupied by individuals from the population
- Determine from study findings whether opportunities exist to further facilitate migrations to and from the designated endangered population area
- Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s).

#### 7.2.5.3. Bats (*microchiropteran bats and Megabats*)

The vegetation within the study area is likely to be used as foraging habitat for threatened microbat species; threatened microbat species may also forage along the 1<sup>st</sup> 2<sup>nd</sup> and 3<sup>rd</sup> order Strahler stream identified within the study area

Threatened microbat species listed under the BC Act and/or EPBC Act which are likely to forage within the study area and have been recorded from the BioNet Wildlife Atlas search include; *Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat), *Miniopterus australis* (Little Bent-winged Bat), *Myotis macropus* (Southern Myotis), *Scoteanax rueppellii* (Greater Broad-nosed Bat), *Miniopterus orianae oceanensis* (Large Bent-winged Bat), *Chalinolobus dwyeri* (Large-eared Pied Bat) and *Saccolaimus flaviventris* (Yellow-bellied Sheath-tail-bat).

The study area is likely to be used seasonally by *Pteropus poliocephalus* (Grey-headed Flying-fox) to forage on fruiting and flowering trees including the exotic and planted trees across the study area. The study area does not contain a camp site for Grey-headed Flying-fox. The nearest Grey-headed Flying fox camp to the study area is the Nationally Important Gordon park camp located 8 km to the east of the study area (DAWE 2020).

#### 7.2.5.4. Koala

There are 6 BioNet Wildlife Atlas records for Koala recorded within a 5 km radius of the study area. Koala is listed as a Vulnerable species under the BC Act and EPBC Act. Hornsby local government area is included within the State Environmental Planning Policy (Koala Habitat Protection) 2021.

The records have been recorded within the last 8 years (between 2012-2018). There is foraging habitat for Koala within the study area within the vegetated corridor and within private properties. A number of Koala feed tree species were noted during the field survey and include but are not limited to; *Allocasuarina torulosa* (Forest Oak), *Angophora costata* (Smooth-barked Apple) *Corymbia gummifera* (Red Bloodwood) *Eucalyptus pilularis* (Blackbutt), *Syncarpia glomulifera* (Turpentine) were recorded within the study area. These species are listed on Schedule 2, Central Coast koala management area of the *State Environmental Planning Policy (Koala Habitat Protection) 2021*. There are very likely to be additional Koala feed tree species, listed within Schedule 2 present within the study area, following further field investigations.

#### 7.2.5.5. Amphibians

The study area contains ephemeral streams, 1<sup>st</sup> 2<sup>nd</sup> and 3<sup>rd</sup> order Strahler streams within the study area. Deep leaf litter and rocks are present along the banks of the streams. The streams are suitable habitat for amphibians; including threatened amphibian species listed under the BC Act and/or EPBC Act; *Pseudophryne australis* (Red-crowned Toadlet) and *Heleioporus australiacus* (Giant Burrowing Frog). There are 22 BioNet Wildlife Atlas records for Red-crowned Toadlet within a 5 km radius of the study area. There are also 2 records for Giant Burrowing Frog within a 5 km radius of the study area.

There are also 7 BioNet Wildlife Atlas records for *Litoria aurea* (Green and Golden Bell Frog) within a 5 km of the study area. Further field survey would be required to identify if potential habitat for this species (i.e. standing water bodies water with native fringing vegetation) is present within the study area.

#### 7.2.5.6. Invertebrates

*Pommerhelix duralensis* (Dural Land Snail) has been recorded within a 5 km radius of the study area. Dural Land Snail favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris (Ridgeway et al., 2014). Dural Land Snail is listed as Endangered under the BC Act and EPBC Act.

There is good quality habitat for this species within the Byles Creek corridor. The species is a shale influenced habitat specialist. The soils within the study area contain a shale-sandstone influence and deep leaf litter at the base of large remnant trees and rocks which are favoured for sheltering are abundant within the Byles Creek corridor.

The Dural land snail occurs on both public and private land (Commonwealth Conservation Advice *Pommerhelix duralensis* (Dural land snail), 2015). There may be potential habitat for Dural Land Snail present within the leaf litter at the base of remnant and planted native canopy species within private properties in the study area. However, habitat for this species is less likely to be utilised as the habitat has been historically modified for development of residential housing and is disturbed through on-going maintenance through sweeping of leaves, mowing lawns and is less likely to be used as habitat for this species in comparison to the better quality habitat within the study area (i.e. the habitat within the Byles Creek corridor).

## 7.2.6. Ecological Constraints

### 7.2.6.1. Summary of Ecological Values

The significant biodiversity values on and in close vicinity to the site are:

- Critically Endangered Ecological Community Blue Gum High Forest
- Regionally significant Coachwood Rainforest
- Locally significant Blackbutt Gully Forest
- Connectivity to Lane Cove National Park (LCNP)
- Habitat for threatened fauna including Powerful Owl, Gang-Gang Cockatoo, Red-crowned Toadlet, Little Bent-winged Bat and microbats
- Gang-gang Cockatoo endangered population in the Hornsby and Ku-ring-gai Local Government Areas
- Habitat for threatened flora including *Darwinia biflora*, *Genoplesium baueri*, *Leptospermum deanei* and *Tetratheca glandulosa*.

The potential ecological values associated with the study area are described below and constraints are mapped in Figure 18.

### 7.2.6.2. High ecological values:

This includes all the significant biodiversity values. Direct (removal of vegetation) and indirect impacts to these areas may trigger a likely significant impact under section 7.3 of the BC Act 2016 requiring the preparation of a Biodiversity Development Assessment Report and the concurrence of OEH for approval

### 7.2.6.3. Medium ecological values:

This includes the remnant urban trees. Changes to the remnant urban canopy can result in the loss of biodiversity values including their habitat value for urban wildlife, as part of corridor linkages and genetic values.

### 7.2.6.4. Low ecological values:

This includes the urban developed land and exotic garden as well as disturbed, weedy vegetation.

## 7.2.7. Biodiversity Conservation Act 2016

In November 2016, the NSW parliament passed the *Biodiversity Conservation Act 2016* (BC Act). This new legislation replaced the *Threatened Species Conservation Act 1995* (TSC Act) and took effect 25 August 2017. Among other things, the BC Act introduces requirements for biodiversity assessment and requires proponents to offset certain biodiversity impacts through the purchase and retirement of biodiversity credits. For developments under Part 4 of the EP&A Act, the Biodiversity Offsets Scheme (BOS) and Biodiversity Assessment Method (BAM), requiring the preparation of a Biodiversity Development Assessment Report (BDAR), that may be triggered by the following means:

- Biodiversity Values Map
- Clearing threshold
- Significant impact to biodiversity values.



Figure 18: Ecological constraints within the study area

### 7.2.7.1. Biodiversity Values Map

Development on land mapped on the NSW Government Biodiversity Values Map will trigger the Biodiversity Offsets Scheme (BOS) under the NSW BC Act shown in Figure 19.

### 7.2.7.2. Clearing Threshold

Development that clears native vegetation that exceeds the area threshold associated with the minimum lot size for the property (Table 5) and will trigger the BOS.

**Table 5 Clearing area threshold**

Minimum lot size associated with the property (if no minimum lot size, actual lot size applies)	Threshold for clearing native vegetation, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

### 7.2.7.3. Test of significance

For developments within the study area, the impacts to threatened species and threatened ecological communities listed under Section 7.3 of the BC Act are required to be assessed in accordance with Section 7.3 of the BC Act, known as ‘test of significance’ (also known as a 5-part test).

The 5-part test is used to determine if the development is likely to have a significant impact on any threatened species, population or ecological community. If a significant impact is indicated by the 5-part test, then the proposal would trigger the BOS and a BAM assessment is required by preparing a BDAR.

### 7.2.7.4. Key Threatening Processes

Several Key Threatening Processes (KTPs) listed under the BC Act and / or EPBC Act are likely to be relevant to development within the study area. The most relevant KTPs are:

- Clearing of native vegetation (BC Act) / Land clearance (EPBC Act)
- Loss of Hollow-bearing Trees
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants Invasion, establishment and spread of Lantana (*Lantana camara*)
- Removal of dead wood and dead trees).

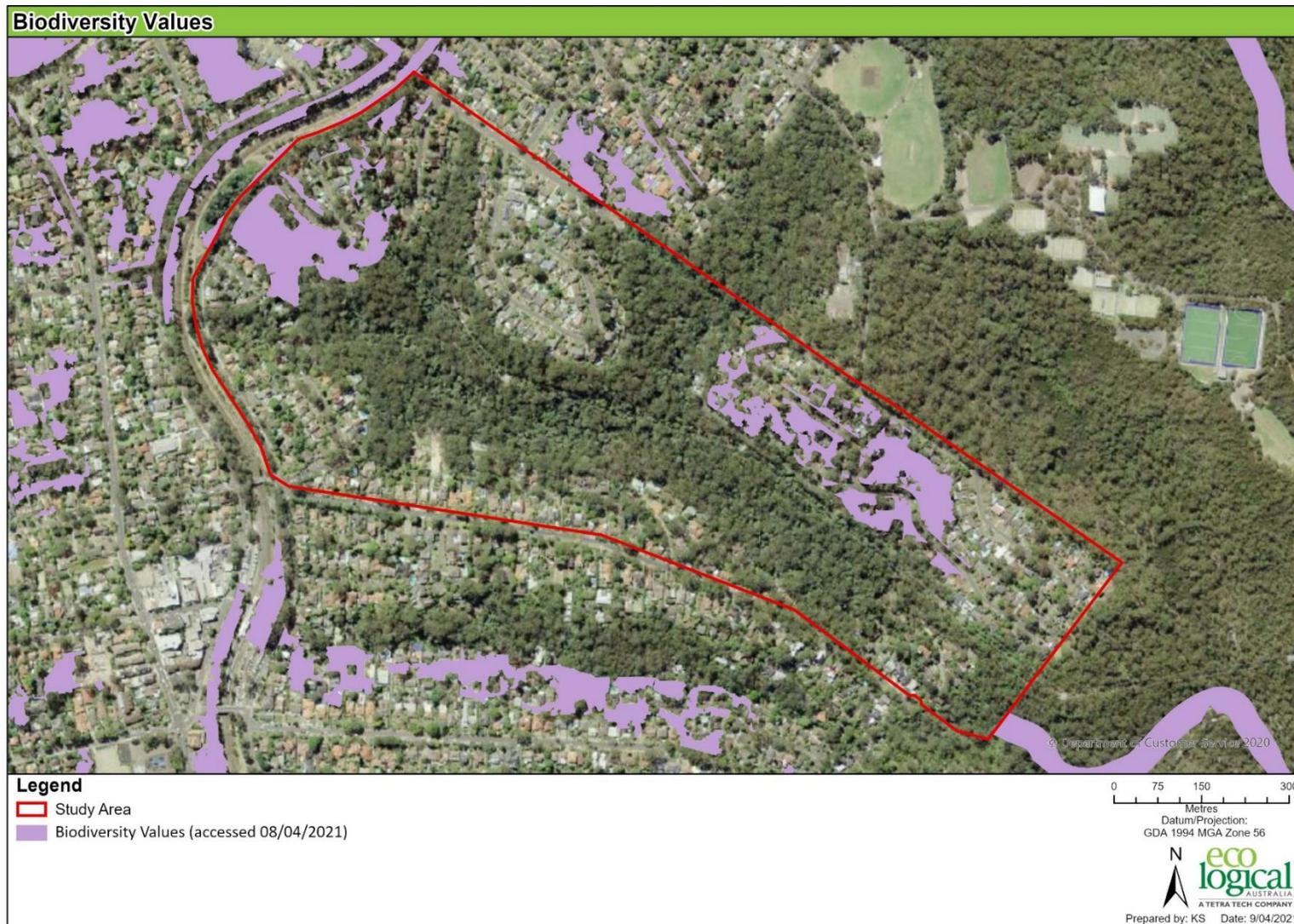


Figure 19: NSW Biodiversity Values Map

### 7.2.8. Significance assessment (EPBC Act)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where 'Matters of National Environmental Significance' (MNES) may be affected. Under the Act any action which "has, will have, or is likely to have a significant impact on a Matter of National Environmental Significance" is defined as a "controlled action", and requires approval from the Commonwealth Department of the Environment and Energy (DotEE) which is responsible for administering the EPBC Act. A planning proposal is not considered an action.

The process includes conducting a significant impact criteria assessment for listed threatened species and ecological communities that represent a MNES and may be impacted as a result of the proposed action. Significant impact guidelines (DAWE 2013) have been developed by the Commonwealth, to provide assistance in conducting the Assessment of Significance and to outline criteria to determine whether or not a referral to the Commonwealth is required.

Some proposed developments within the study area may be required to assess MNES under the EPBC Act Significance Assessment.

### 7.2.9. State Environmental Planning Policies

#### 7.2.9.1. State Environmental Planning Policy (SEPP) 19 – Bushland in Urban Areas

Its general aim is to protect and preserve bushland within the urban areas because of:

- *its value to the community as part of the natural heritage,*
- *its aesthetic value, and*
- *its value as a recreational, educational and scientific resource.*

For development on land adjoining land zoned or reserved for public open space, development by a public authority or development consent must take into account:

- *the need to retain any bushland on the land,*
- *the effect of the proposed development on bushland zoned or reserved for public open space purposes and, in particular, on the erosion of soils, the siltation of streams and waterways and the spread of weeds and exotic plants within the bushland, and*
- *any other matters which, in the opinion of the approving or consent authority, are relevant to the protection and preservation of bushland zoned or reserved for public open space purposes.*

#### 7.2.9.2. SEPP (Koala Habitat Protection) 2021

Koala SEPP 2021 commenced 17 March 2021 and applies to all land use zones within the Hornsby local government area. The principles of the Koala SEPP 2021 are to help reverse the decline of koala populations by ensuring koala habitat is properly considered during the development assessment process, and to provide a process for councils to strategically manage koala habitat through the development of koala plans of management.

Where there is no approved koala plan of management for land, the SEPP applies if the land ownership has an area of at least 1 hectare (including adjoining land within the same ownership). Before a council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on koalas or koala habitat. Development consent can be granted if Council is satisfied that the development is likely to have low or

no impact on koalas or koala habitat. If the development is likely to have a higher level of impact on koalas or koala habitat, a koala assessment report must be considered as part of a development application. Despite the above, Council may grant development consent if the site does not include any trees belonging to the koala use tree species listed in Schedule 2 for the relevant koala management area, or the site is not core koala habitat, or tree diameters are 10 cm or less, or includes only horticultural or agricultural plantations.

Under the SEPP core koala habitat means—

- *an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or*
- *(b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.*

### 7.2.10. Hornsby LEP 2013

#### 7.2.10.1. Terrestrial Biodiversity

The land within the study area that is zoned RE1 is mapped on the Terrestrial Biodiversity map. Section 6.4 Terrestrial biodiversity of the Hornsby LEP 2013 applies to the land on the map. Its objectives are to maintain terrestrial biodiversity by—

- *protecting native fauna and flora, and*
- *protecting the ecological processes necessary for their continued existence, and*
- *encouraging the conservation and recovery of native fauna and flora and their habitats.*

When determining a DA, a consent authority must consider whether the development is likely to have—

- *any adverse impact on the condition, ecological value and significance of the fauna and flora on the land, and*
- *any adverse impact on the importance of the vegetation on the land to the habitat and survival of native fauna, and*
- *any potential to fragment, disturb or diminish the biodiversity structure, function and composition of the land, and*
- *any adverse impact on the habitat elements providing connectivity on the land, and*
- *any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.*

Development consent must not be granted to the development unless the consent authority is satisfied that:

- *the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or*
- *if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or*
- *if that impact cannot be minimised—the development will be managed to mitigate that impact.*

### 7.2.10.2. Schedule 5 Environmental Heritage

Clause 5.10 of the Hornsby LEP requires a DA to undertake a heritage assessment for items included within Schedule 5 Environmental Heritage. Several items are listed as Environmental Heritage within the study area (Table 6) and shown on the Heritage Map.

**Table 6: Environmental heritage items within the Study Area**

Suburb	Item name	Address	Property description	Significance	Item no
Beecroft	Street trees and bushland	Malton Road	Road reserve	Local	114
Beecroft	Bushland Reserve	Sutherland Road and Park Avenue—Byles Creek Valley	Lot 3, DP 540850; Lot 14, DP 562351; Lot 3, DP 530227; Lot 15, DP 237044; Lot 80, DP 1150971; Lot 23, DP 614741; Lot 6, DP 229639; Lot 204, DP 806307	Local	140
Beecroft	Conservation Area General				

### 7.2.11. Hornsby Development Control Plan (DCP) 2013

The Hornsby DCP references that the objectives of the Hornsby Shire Biodiversity Conservation Strategy (2006) include *to achieve an improvement in the quality and extent of existing indigenous vegetation in Hornsby Shire, maintain biodiversity on private properties, and to conserve and recreate biodiversity connectivity across fragmented landscapes.*

It contains provisions for the protection of trees under Clause 1B.6.1 Tree Preservation Prescribed Trees-

The prescribed trees that are protected by the Vegetation SEPP and/or Clause 5.10 of the HLEP and this Section of the DCP includes:

- *trees except exempt tree species in Hornsby Shire, as listed in Table 1B.6 (a) or subject to the Biodiversity Offset Scheme,*
- *all trees on land within a heritage conservation area described within the HLEP, and*
- *all trees on land comprising heritage items listed within the HLEP.*

Council permission must be obtained for removal of prescribed trees, except for exempt trees. It requires trees to be assessed using arboricultural, ecological and industry accepted safety evaluation methods to determine the safe useful life expectancy of the trees.

Clause 1B.6.2 Vegetation Preservation prohibits damage or removal of native vegetation except for clearing of 10 m<sup>2</sup> vegetation on urban land once every 5 years. Within the study area, this exemption does not apply to:

- *land located within 50 metres of and including land identified as “Terrestrial Biodiversity” on the Terrestrial Biodiversity Map in HLEP,*
- *land located within 50 metres of and including land that contains native vegetation which is habitat or potential habitat for species, populations or ecological communities listed in Schedule 1 and 2 of the Biodiversity Conservation Act 2016 and protected matters listed under the Commonwealth EPBC Act 1999.*

Clause 1C.1.1 Biodiversity includes desired outcomes:

- *Development that provides for the conservation of biodiversity including threatened species and populations, endangered ecological communities, remnant indigenous trees, regionally and locally significant terrestrial and aquatic vegetation.*
- *Development that maintains habitat for native wildlife and wildlife corridors to provide for the movement of fauna species.*

It contains general prescriptive measures whereby development should seek to:

- *avoid potential adverse impact on biodiversity,*
- *if that impact cannot be avoided, minimise that impact, or*
- *if the impact cannot be minimised, to mitigate the impact.*

It requires a flora and fauna assessment is required for development that may impact on land mapped as Biodiversity on the HLEP Terrestrial Biodiversity Map, or native vegetation which is habitat for threatened species, and development should avoid the fragmentation of existing native vegetation.

Development should seek to retain unique environmental features of the site including rock outcrops, wetlands and the like, watercourses, drainage lines and riparian land, groups of significant trees and vegetation, and mature hollow trees and other fauna habitat features on the site.

Development should incorporate and maintain a buffer zone to significant flora and fauna, which should not include buildings, structures and earthworks within the required buffer zone, shown in Table 7.

**Table 7: Excerpt of Hornsby DCP 2013 - buffer zones to vegetation types**

Significant Vegetation Type	Minimum Buffer Zone (metres)
Endangered ecological communities and regionally significant bushland (as mapped in the HLEP Terrestrial Biodiversity Map)	20m
Wetland or saltmarsh plant communities	20m
Populations of threatened flora species, habitat for threatened species, locally significant bushland, groups of remnant indigenous trees	10m

## 8. Bushfire

### 8.1. Methodology

Analysis of the Byles Creek study area was undertaken in relation to bushfire constraints and included the following aspects:

- Review of bush fire prone land mapping (BFPL)
- Review of the bushfire hazard influencing the study area with regard to vegetation and slope; and
- Review of existing bushfire constraints mapping.

### 8.2. Maps

Figures 20 - 22 on the following pages display maps depicting BFPL, slope constraints related to greater than 18 degree slopes and existing constraints mapping (ELA, 2020).

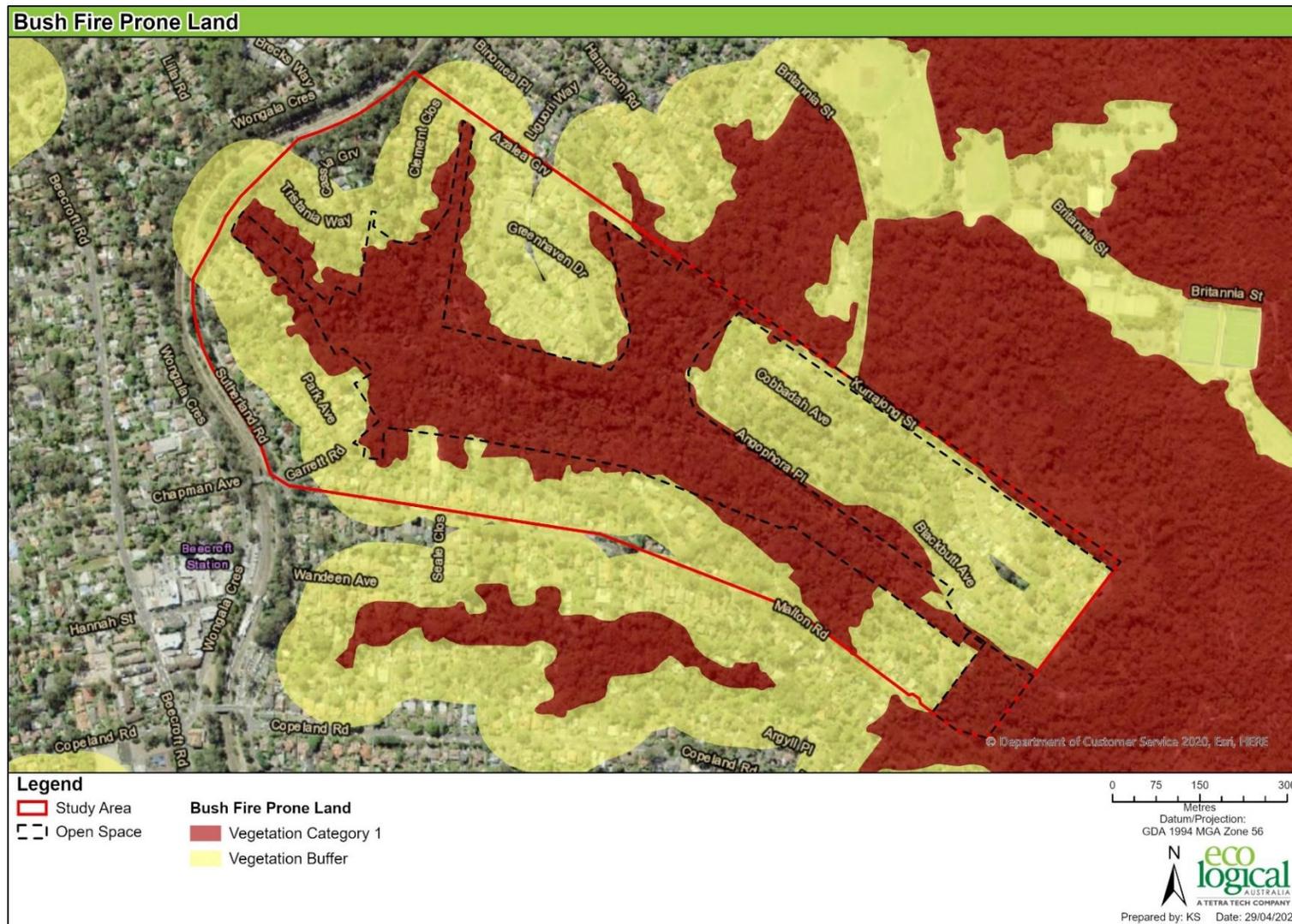


Figure 20: Bush Fire Prone Land Mapping



Figure 21: Slope constraints, areas >18 degrees

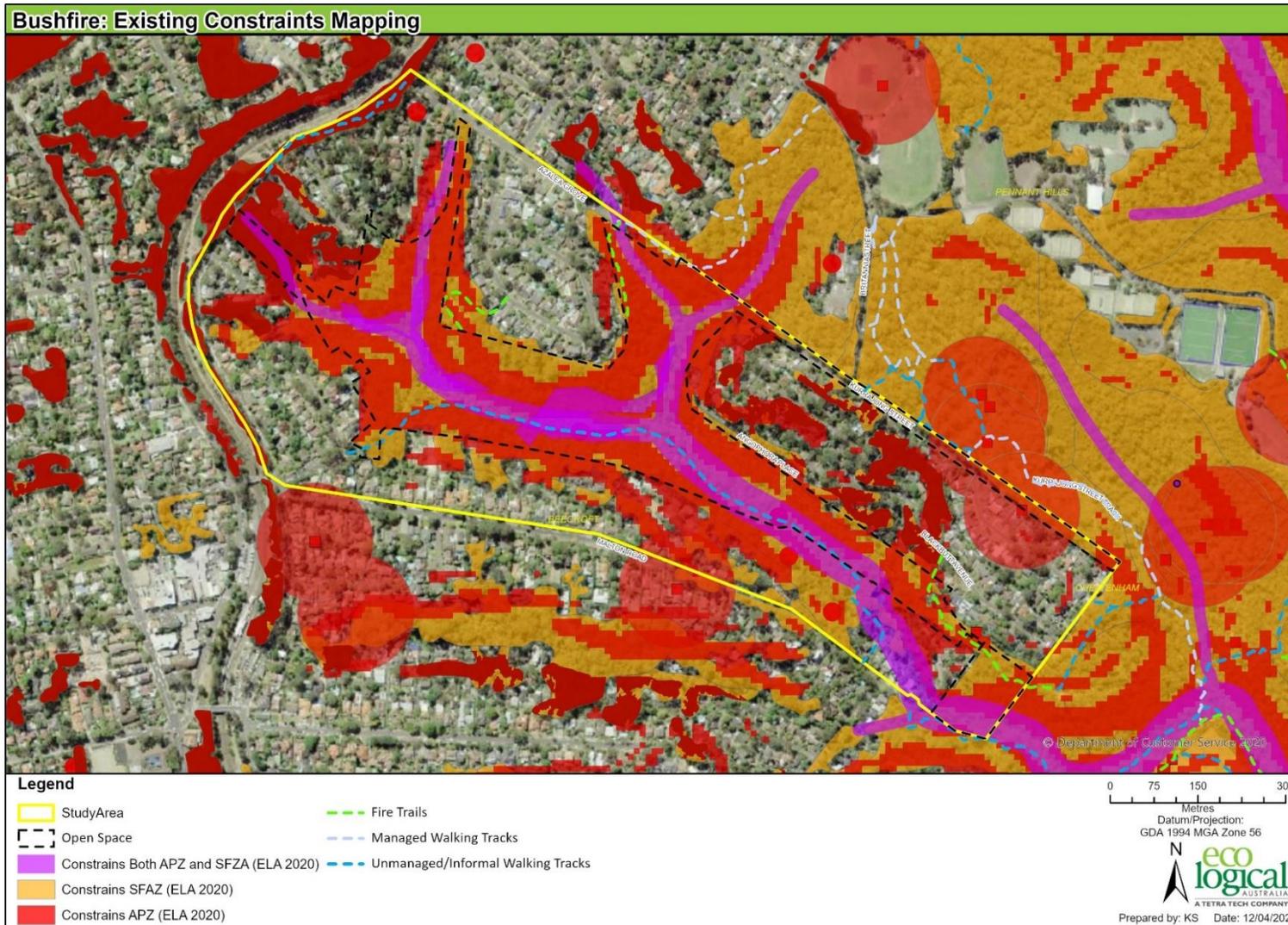


Figure 22: Existing bushfire constraints mapping (ELA, 2020)

### 8.3. Results and Discussion

As described in the following sections, the Byles Creek study area is constrained by the presence of bush fire prone vegetation (BFPV) and the resulting requirements of Planning for Bushfire Protection (PBP) (RFS, 2019), as triggered by the *EP&A Act* for development on BFPL.

#### 8.3.1. Review of Bush Fire Prone Land Mapping

Bush Fire Prone Land is certified by the NSW Rural Fire Service in accordance with legislative requirements and published by the Department of Planning, Industry and Environment. The presence of mapped BFPL within the study area, including the vegetation buffer, requires that any future development must satisfy the aim and objectives of PBP (RFS 2019). On formally mapped BFPL, an assessment is required to consider the vegetation hazard and effective slope within the site and adjoining areas, in order to determine the required site-specific bush fire protection measures in relation to any proposed development.

The core Byles Creek Open Space area (RE1 zone) is predominantly mapped as Vegetation Category 1, as shown in **Figure 20**. This is the highest BFPL category and corresponds to the highest bushfire risk (RFS, 2015), with Category 1 BFPV considered to have the highest likelihood of fully developed fires forming and is subject to a 100 m buffer. Much of the residential area surrounding the RE1 zones falls within the bushfire prone vegetation buffer.

#### 8.3.2. Bushfire Hazard

A review of vegetation and slope applicable to the study area was undertaken.

Vegetation was validated on site by ELA ecologists, with Blackbutt Gully Forest, corresponding to *PCT 1181*, most prominent throughout the study area, particularly within the open space zone (Figure 15). Blue-Gum Shale Forest and Coachwood Rainforest are also mapped within the study area. Table 8 identifies the corresponding PBP vegetation formation for each mapped vegetation community.

**Table 8: PBP vegetation formation for corresponding vegetation communities**

Hornsby Vegetation Communities	Plant Community Types	PBP Vegetation Formation <sup>1</sup>
Blue Gum Shale Forest	1237. Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion	Forest
Blackbutt Gully Forest	1181. Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	Forest
Coachwood Rainforest	905. Lilly Pilly - Coachwood warm temperate rainforest on moist sheltered slopes and gullies, Sydney Basin Bioregion and South East Corner Bioregion	Rainforest

<sup>1</sup>As per A1.2 of PBP

Review of slope throughout the study area utilised a 20 cm slope raster derived from LiDAR and provided by HSC. The raster was classified into 5 degree increments (Figure 2), which demonstrates that much of the open space area and adjoining residential area is occupied by steep terrain, frequently greater than 20 degrees. A key constraint resulting from the steep terrain is the requirement for a performance assessment for where the effective slope impacting future development is greater than 20 degrees, as outlined in A1.4 of PBP.

Additional slope constraints include areas where slope is greater than 18 degrees (**Figure 21**). These areas present a key constraint for asset protection zones (APZs) as highlighted in section 3.2.2 of PBP. Generally, APZs on slopes greater than 18 degrees are not permitted due to difficulties associated with maintenance and reduced effectiveness (RFS 2019). For an APZ to be considered on land greater than 18 degrees, as per the requirements of PBP, a management plan must be established and approved via the DA process.

An overview of APZ requirements for residential and Special Fire Protection Purpose (SFPP) development, in accord with PBP and based on vegetation type and slope are tabulated in Table 9 below.

**Table 9: Indicative residential APZ requirements for based on vegetation formation and slope class**

Vegetation Formation	Slope Class	Residential APZ (BAL-29) <sup>1</sup>	SFPP APZ <sup>2</sup>
Forest	All upslope and flat	24 m	67 m
	0-5° downslope	29 m	79 m
	5 -10° downslope	36 m	93 m
	10-15° downslope	45 m	100 m
	15-20° downslope	56 m	100 m
Rainforest	All upslope and flat	11 m	38 m
	0-5° downslope	14 m	47 m
	5-10° downslope	18 m	57 m
	10-15° downslope	23 m	69 m
	15-20° downslope	30 m	81 m

<sup>1</sup>As per A1.12.2 of PBP for FDI100

### 8.3.3. Review of Bushfire Constraints Mapping

Review of existing constraints mapping developed by ELA as part of the Hornby Bushfire Risk Management Strategy (ELA, 2020) was also undertaken for this study. As shown in **Figure 22**, the study area is constrained in a number of locations with regard to the provision of APZ and Strategic Fire Advantage Zones (SFAZs). It is therefore unlikely that significant further bushfire management of the public land can be undertaken that would provide a bushfire protection outcome to existing or any future development on adjoining private land as the ecological value of the public land, coupled with the slope, mean the ability to provide APZs and SFAZ areas compliant with RFS guidelines is limited.

### 8.3.4 Overview of PBP bushfire protection measures and capacity for development

The capacity of private land to meet bushfire protection measures is influenced by various constraints including:

- Provision of APZs and the ability of future development to meet setback requirements as detailed in Table 9 due to slope and vegetation constraints
- Access and the ability of future development meeting the requirements of PBP, particularly the provision of perimeter roads
- Water supply and the ability of future development to meet the requirement of PBP

A high-level review of different development types and their ability to conform with bushfire protection requirements (within the Study Area) has been undertaken and is summarised as follows:

- In fill development: capacity to meet PBP requirements
- Subdivision: capacity to meet PBP requirements are limited due to access and APZ constraints
- Centre-based child care facilities, educational establishments and other Special Fire Protection Purpose Developments (SFPP): capacity to meet PBP requirements is unlikely due to SFPP APZ and access requirements.

## 9. Infrastructure

### 9.1. Methodology

An analysis of infrastructure in the Byles Creek study area was undertaken using a compilation of sources including Dial Before You Dig, cadastre data, shapefiles supplied by HSC and Government data.

Dial Before You Dig searches provides comprehensive infrastructure network information. Dial Before You Dig notification of no more than 30 days before commencement of work is a legislative requirement for any work on a private property, work by a public authority and work on underground utility services. Dial Before You Dig searches were requested from the following infrastructure providers:

- NBN Co
- Optus
- TPG
- Sydney Water
- Jemena
- Ausgrid.

Search results were received from all providers except for Ausgrid as the search area was deemed to be too complex. Sydney Water data supplied by Council matched the Dial Before You Dig search results and was used for mapping analysis.

The search results received from all providers were supplied in PDF format displayed as lines and points. ESRI's GIS application ArcGIS Pro was used to create shapefiles of the supplied search information. The process to create the shapefiles is shown below.

- PDF files saved as jpeg files with an identifying name and number corresponding with the search results
- Jpeg files loaded into ArcGIS Pro
- Jpeg imagery was georeferenced by match lot alignments shown on the search data and lot cadastre data
- Above process repeated for all relevant PDF files, PDF files outside of the study area or did not show infrastructure were excluded from this process
- The data was digested and saved as polyline and point shapefiles for each infrastructure component.

Other infrastructure data supplied by Hornsby Shire Council:

- Drainage easements
- Sydney Water infrastructure
- Council managed storm water infrastructure.

Government sources data:

- Electricity Transmission Lines (NSWLPI 2015)
- Electricity Easement (NSWLPI 2015).

The data was compiled into an Infrastructure map (Figure 23) displaying the Dial Before You Dig search results, electricity transmission line and the electricity easement and a Water Infrastructure map (Figure 24) displaying council managed water infrastructure and Sydney Water managed infrastructure.

## 9.2. Maps

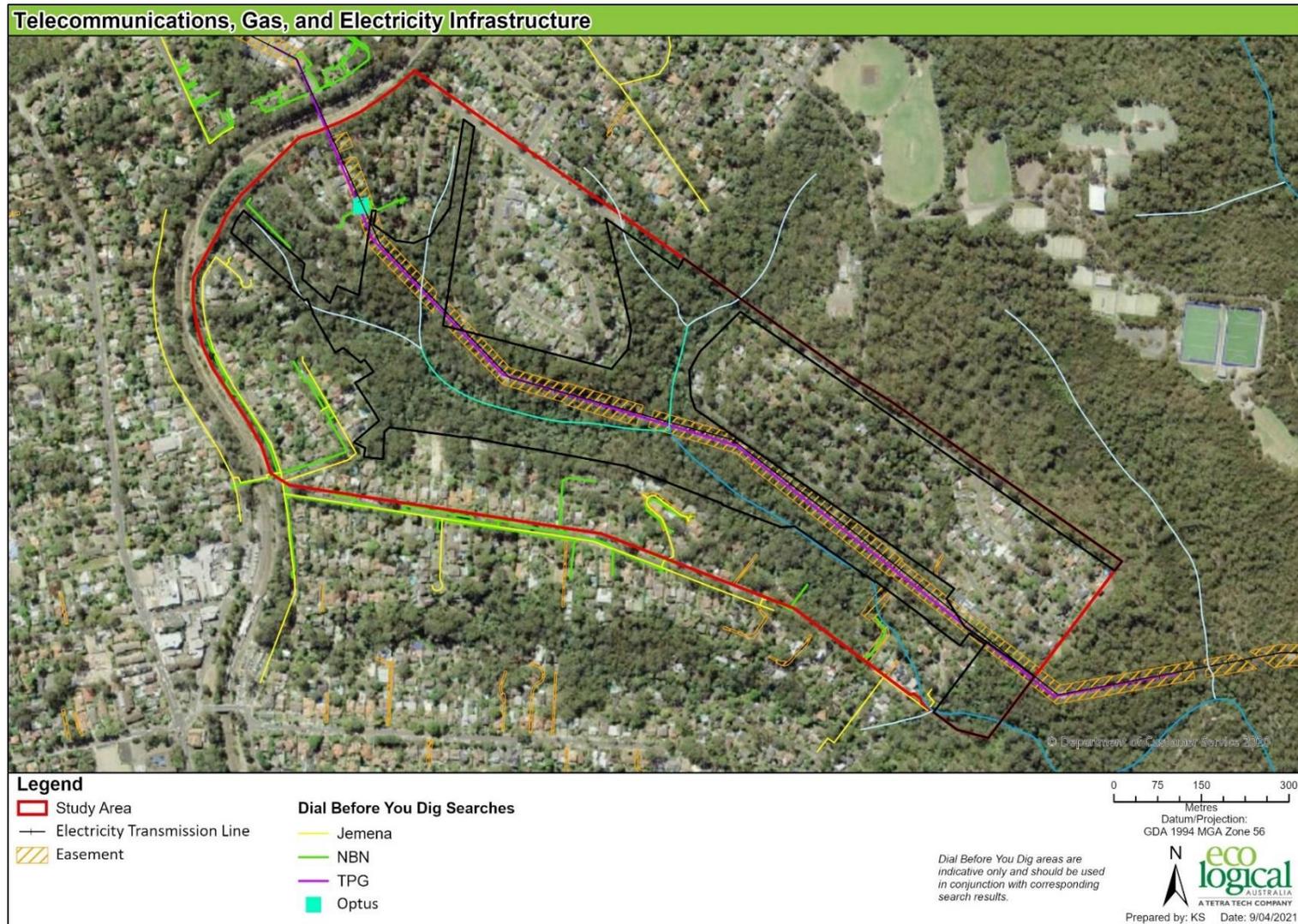


Figure 23: Infrastructure



Figure 24: Sydney Water and drainage infrastructure

## 9.3. Results and Discussion

### 9.3.1. Telecommunications, gas and electricity infrastructure

The Dial Before You Dig search results are shown in Figure 23. The search results were digitised from PDFs and should be used in conjunction with the official results produced by the Dial Before You Dig search.

The NBN telecommunications and gas (Jemena) networks are confined to the residential areas within the study area extending mostly along the southern and western edges. The Optus search results showed one point within residential property located in the north west. The telecommunications and gas infrastructure are wholly outside the designated open space area.

TPG infrastructure, the electricity transmission line and easement extend through the study area from the north west residential, transecting bushland along and within the northern Open Space boundary in the central region of the study area until reaching the study area boundary in the south west. TPG infrastructure follows the electricity transmission thus limiting impacts within the Open Space area.

### 9.3.2. Water Infrastructure

The Sydney Water and council managed water infrastructure is an extensive network throughout the entire study area, however, is less concentrated in the Open Space area. Sewer infrastructure is the predominate water infrastructure type in the Open Space area with some water mains extending from the southern Open Space boundary. Contamination from sewer overflow and leakages is associated risk, overflows can occur from stormwater inflows and during dry periods from chokes, leaks from damaged pipes and damage from tree roots.

Access to TPG, electricity transmission lines/easement and water infrastructure within the Open Space area is required for maintenance and repair and will need to be maintained.

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## Appendix A Likelihood of Occurrence

**Table 10: Threatened ecological communities (TECs) likelihood table**

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Blue Gum High Forest of the Sydney Basin Bioregion	CEEC	CEEC	Occurs only in areas where rainfall is high (above 1100 millimetres per year) and the soils are relatively fertile and derived from Wianamatta shale. In lower rainfall areas, it grades into Sydney Turpentine-Ironbark Forest. A moist, tall open forest community, with dominant canopy trees of Sydney Blue Gum ( <i>Eucalyptus saligna</i> ) and Blackbutt ( <i>E. pilularis</i> ). Forest Oak ( <i>Allocasuarina torulosa</i> ) and Sydney Red Gum ( <i>Angophora costata</i> ) also occur. Species adapted to moist habitat such as Lilly Pilly ( <i>Acmena smithii</i> ), Sandpaper Fig ( <i>Ficus coronata</i> ), Rainbow Fern ( <i>Calochleana dubia</i> ) and Common Maidenhair ( <i>Adiantum aethiopicum</i> ) may also occur. Originally restricted to the ridgelines in Sydney's north from Crows Nest to Hornsby, and extending west along the ridges between Castle Hill and Eastwood. In 2000 there was less than 200 hectares remaining (about 4.5% of its original extent). It only occurs in small remnants of which the largest is less than 20 hectares. The remnants mainly occur in the Lane Cove, Willoughby, Ku-ring-gai, Hornsby, Baulkham Hills, Ryde and Parramatta local government areas. An example of Blue Gum High Forest can be seen at the Dalrymple-Hay Nature Reserve, St Ives	Likely
Castlereagh Scribbly Gum and Agnes Banks Woodland	VEC (Castlereagh Scribbly Gum Woodland)/ CEEC (Agnes Banks Woodland)	EEC	Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion. Dominated by <i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> , <i>Angophora bakeri</i> and <i>E. sclerophylla</i> . A small tree stratum of <i>Melaleuca decora</i> is sometimes present, generally in areas with poorer drainage. It has a well-developed shrub stratum consisting of sclerophyllous species such as <i>Banksia spinulosa</i> var. <i>spinulosa</i> , <i>Melaleuca nodosa</i> , <i>Hakea sericea</i> and <i>H. dactyloides</i> (multi-stemmed form). The ground stratum consists of a diverse range of forbs including <i>Themeda australis</i> , <i>Entolasia stricta</i> , <i>Cyathochaeta diandra</i> , <i>Dianella revoluta</i> subsp. <i>revoluta</i> , <i>Stylidium graminifolium</i> , <i>Platysace ericoides</i> , <i>Laxmannia gracilis</i> and <i>Aristida warburgii</i> .	No
Coastal Oak (Casuarina glauca) Forest of NSW and SE Qld ecological community	EEC	EEC	Found on the coastal floodplains NSW North Coast, Sydney Basin and part of the South East Corner IBRA bioregions. Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. The ecological community is typically found where groundwater is saline or	No

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
			brackish but can occur in areas where groundwater is relatively fresh. It is typically found on coastal flats, floodplains, drainage lines, lake margins, wetlands and estuarine fringes where soils are at least occasionally saturated, water-logged or inundated. These are typically associated with low-lying coastal alluvial floodplains and alluvial flats (Keith and Scott, 2005). Minor occurrences can be found on coastal dune swales or flats, particularly deflated dunes and dune soaks.	
Coastal Upland Swamps in the Sydney Basin Bioregion	EEC	EEC	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateaux) to the Robertson district in the south (in the Woronora plateau). Occurs primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils. May include tall open scrubs, tall closed scrubs, closed heaths, open graminoid heaths, sedgeland and fernlands. Larger examples may include a complex of these structural forms.	No
Cooks River / Castlereagh Ironbark Forest	EEC	CEEC	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (forest red gum), <i>E. amplifolia</i> (cabbage gum), <i>Angophora floribunda</i> (rough-barked apple) and <i>A. subvelutina</i> (broad-leaved apple). <i>Eucalyptus baueriana</i> (blue box), <i>E. botryoides</i> (bangalay) and <i>E. elata</i> (river peppermint) may be common south from Sydney. <i>E. ovata</i> (swamp gum) occurs on the far south coast, <i>E. saligna</i> (Sydney blue gum) and <i>E. grandis</i> (flooded gum) may occur north of Sydney, while <i>E. benthamii</i> is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including <i>Melaleuca decora</i> , <i>M. styphelioides</i> (prickly-leaved teatree), <i>Backhousia myrtifolia</i> (grey myrtle), <i>Melia azadarach</i> (white cedar), <i>Casuarina cunninghamiana</i> (river oak) and <i>C. glauca</i> (swamp oak). Scattered shrubs include <i>Bursaria spinosa</i> , <i>Solanum prinophyllum</i> , <i>Rubus parvifolius</i> , <i>Breynia oblongifolia</i> , <i>Ozothamnus diosmifolius</i> , <i>Hymenanthera dentata</i> , <i>Acacia floribunda</i> and <i>Phyllanthus gunnii</i> . The groundcover is composed of abundant forbs, scramblers and grasses.	No
River-flat Eucalypt Forest	EEC	-	The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (forest red gum), <i>E. amplifolia</i> (cabbage gum), <i>Angophora floribunda</i> (rough-barked apple) and <i>A. subvelutina</i> (broad-leaved apple). Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains.	No

Name	BC Act	EPBC Act	Habitat Associations	Likelihood of Occurrence
Shale Sandstone Transition Forest	CEEC	CEEC	Occurs at the edges of the Cumberland Plain, where clay soils from the shale rock intergrade with earthy and sandy soils from sandstone, or where shale caps overlay sandstone. The boundaries are indistinct, and the species composition varies depending on the soil influences. It typically occurs in moderately wet sites, with an annual rainfall of 800-1100mm per year, and on clay soils derived from Wianamatta shale. The tree canopy is dominated by Turpentine and a variety of eucalypt species. Its distribution is mainly on the Cumberland Plain of the Sydney region. Was not recorded during the site inspection s.	No
Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion	EEC	CEEC	Open forest, with dominant canopy trees including <i>Syncarpia glomulifera</i> (Turpentine), <i>Eucalyptus punctata</i> (Grey Gum), <i>Eucalyptus paniculata</i> (Grey Ironbark) and <i>E. eugenioides</i> (Thin-leaved Stringybark). In areas of high rainfall (over 1050 mm per annum) <i>E. saligna</i> (Sydney Blue Gum) is more dominant. The shrub stratum is usually sparse and may contain mesic species such as <i>Pittosporum undulatum</i> (Sweet Pittosporum) and <i>Polyscias sambucifolia</i> (Elderberry Panax). Occurs close to the Shale/Sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaux. A transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges.	No
Western Sydney Dry Rainforest and Moist Woodland on Shale	EEC	CEEC	A dry vine scrub community of the Cumberland Plain, western Sydney. Canopy trees include <i>Melaleuca styphelioides</i> (Prickly Paperbark), <i>Acacia implexa</i> (Hickory Wattle) and <i>Alectryon subcinereus</i> (Native Quince) . Many rainforest species occur in the shrub layer, such as <i>Notelaea longifolia</i> (Mock Olive) (, <i>Clerodendrum tomentosum</i> (Hairy Clerodendrum) and <i>Pittosporum revolutum</i> (Yellow Pittosporum). The shrub layer combines with vines, such as <i>Aphanopetalum resinsum</i> (Gum Vine), <i>Pandorea pandorana</i> (Wonga Vine) and <i>Cayratia clematidea</i> (Slender Grape) to form dense thickets in sheltered locations.	No

EEC= Endangered Ecological Community, VEC = Vulnerable Ecological Community, CEEC = Critically Endangered Ecological Community.

Table 11: Threatened species likelihood table

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4A	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West	72	Potential - occasional seasonal foraging habitat features associated with this

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).		species were identified within the site. The site is not within an important breeding area for the species.
<i>Apus pacificus</i>	Fork-tailed Swift		M	Recorded in all regions of NSW. Riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	13	Unlikely - suitable habitat not identified within the site.
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V		Widespread in NSW from coast to inland including the western slopes of the Great Dividing Range and farther west. Species have also been recorded in southern and southwestern Australia. Woodlands and dry open sclerophyll forest, usually eucalypts and mallee associations. Also have recordings in shrub and heathlands and various modified habitats, including regenerating forests. In western NSW, this species is primarily associated with River Red Gum/Black Box/Coolabah open forest/woodland and associated with larger river/creek systems.	21	Potential - occasional seasonal foraging habitat features associated with this species were identified within the site.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V		In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee. Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	216	Likely - habitat features associated with this species were identified within the site
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V		In NSW, widespread along coast and inland to the southern	9	Likely - habitat features associated

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				tablelands and central western plains, with a small population in the Riverina. Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.		with this species were identified within the site
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat		V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	2	Potential – suitable foraging habitat for this species identified within the site.
<i>Cuculus optatus</i>	Oriental Cuckoo, Horsfield's Cuckoo		M	Northern and eastern Australia, records mainly coastal in NSW south to Bega area. Non breeding habitat: monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodland.	5	Potential – suitable habitat for this species identified within the site.
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, mallee and <i>Acacia</i> woodland.	8	Potential – suitable foraging habitat for this species identified within the site.
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll		E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	5	Potential – suitable foraging habitat for this species identified within the site.
<i>Falco hypoleucos</i>	Grey Falcon	E1		Arid and semi-arid zones. In NSW, found chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Shrubland, grassland and wooded watercourses, occasionally in open woodlands near the coast, and near wetlands.	1	Potential – suitable foraging habitat for this species identified within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		South-east coast and ranges of Australia, from southern Qld to Victoria and Tasmania. In NSW, records extend to the western slopes of the Great Dividing Range. Tall (greater than 20m) moist habitats.	7	Potential – suitable habitat for this species identified within the site.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		In NSW, found from the coast westward as far as Dubbo and Albury. Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	58	Potential – suitable habitat for this species identified within the site.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V		Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	4	Unlikely - suitable habitat not identified within the site.
<i>Heleioporus australiacus</i>	Giant Burrowing Frog		V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	2	Potential - suitable habitat identified within the site.
<i>Hieraaetus morphnoides</i>	Little Eagle	V		Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment. Open eucalypt forest, woodland or open woodland, including sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW.	8	Unlikely - suitable habitat not identified within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	77	Unlikely - suitable habitat not identified within the site.
<i>Ixobrychus flavicollis</i>	Black Bittern	V		In NSW, records are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Terrestrial and estuarine wetlands. Also flooded grassland, forest, woodland, rainforest and mangroves where permanent water is present.	1	Unlikely - suitable habitat not identified within the site.
<i>Lathamus discolor</i>	Swift Parrot		CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	56	Unlikely - suitable habitat not identified within the site.
<i>Litoria aurea</i>	Green and Golden Bell Frog		V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing <i>Typha</i> spp. (bullrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.	7	Potential – foraging habitat features were identified within the site.
<i>Lophoictinia isura</i>	Square-tailed Kite	V		In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast. Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	7	Likely - suitable habitat identified within the site and records within study area.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site	of
<i>Micronomus norfolkensis</i>	Eastern Coastal Freetail-bat	V		Found along the east coast from south Qld to southern NSW. Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	15	Unlikely - suitable habitat not identified within the site.	
<i>Miniopterus australis</i>	Little Bentwing-bat	V		East coast and ranges south to Wollongong in NSW. Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	18	Potential - habitat features were identified within the site.	
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V		In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga. Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	654	Potential - foraging habitat features were identified within the site.	
<i>Myotis macropus</i>	Southern Myotis	V		In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers. Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	9	Potential - foraging habitat features were identified within the site.	
<i>Ninox connivens</i>	Barking Owl	V		Wide but sparse distribution in NSW, avoiding the most central arid regions. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	5	Potential - habitat features were identified within the site.	
<i>Ninox strenua</i>	Powerful Owl	V		In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains. Woodland, open sclerophyll forest, tall open wet forest and rainforest.	1080	Potential - foraging habitat features were identified within the site.	
<i>Petauroides volans</i>	Greater Glider		V	This population on the south coast of NSW is bounded by the Moruya	2	Likely - habitat features were	

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				River to the north, Coila Lake to the south and the Princes Highway and cleared land exceeding 700 m in width to the west. Eucalypt forests and woodlands.		identified within the site.
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		Widely though sparsely distributed on both sides of the Great Dividing Range in eastern Australia, from northern Qld to western Victoria. Mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	1	Unlikely - suitable habitat not identified within the site.
<i>Petroica boodang</i>	Scarlet Robin	V		In NSW, it occurs from the coast to the inland slopes. Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	4	Unlikely - suitable habitat not identified within the site.
<i>Petroica phoenicea</i>	Flame Robin	V		In NSW, breeds in upland areas, and in winter many birds move to the inland slopes and plains, or occasionally to coastal areas. Likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands. In winter uses dry forests, open woodlands, heathlands, pastures and native grasslands. Occasionally occurs in temperate rainforest, herbfields, heathlands, shrublands and sedgeland at high altitudes.	1	Unlikely - suitable habitat not identified within the site.
<i>Phascolarctos cinereus</i>	Koala		V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	17	Unlikely - suitable habitat not identified within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site	
<i>Pommerhelix duralensis</i>	Dural Snail	Land	E1	E	Endemic to NSW. Occurs along the northwest fringes of the Cumberland Plain, within the Hills Shire, Blue Mountains City, Penrith City, Hornsby Shire and Parramatta City LGAs. Shale-sandstone transitional landscapes. Found in Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest; Turpentine-Ironbark Forest; Shale/Sandstone Transition Forest; Turpentine Ironbark Margin Forest; Hinterland Sandstone Gully Forest; and Sydney Hinterland Transition Woodland.	74	Potential - suitable habitat identified within the site.
<i>Pseudomys australis</i>	Plains Rat		E4	V	The Plains Rat is restricted to the gibber (stone-covered) plains of Lake Eyre Basin in northern South Australia, and is now presumed to be extinct in Queensland and NSW. The previous distribution of this species extended from the western edge of the Nullabor Range, to central Queensland, as well as the inland slopes of the Great Dividing Range to the mouth of the Murray River. In the Northern Territory, it was formerly present only in the extreme south-east region.	63	Unlikely - suitable habitat not identified within the site.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox			V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	2063	Unlikely - suitable habitat not identified within the site.
<i>Ptilinopus superbus</i>	Superb Dove	Fruit-		V	Principally from north-eastern Qld to north-eastern NSW. Further south, it is confined to pockets of suitable habitat, and occurs as far south as Moruya. Rainforest and closed forests. May also forage in eucalypt or acacia woodland	4	Unlikely - suitable habitat not identified within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				where there are fruit-bearing trees.		
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		There are scattered records of this species across the New England Tablelands and North West Slopes. Rare visitor in late summer and autumn to south-western NSW. Almost all habitats, including wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies.	13	Likely – seasonal foraging habitat available within the study area. No camps identified within study area.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		Both sides of the great divide, from the Atherton Tableland in Qld to north-eastern Victoria, mainly along river systems and gullies. In NSW it is widespread on the New England Tablelands. Woodland, moist and dry eucalypt forest and rainforest.	13	Potential - suitable habitat within the site.
<i>Thalasseus bergii</i>	Crested Tern		M	Identified as a conservation value in the Temperate East and North marine regions. Coastal seas, continental shelf.	1	Potential - suitable habitat within the site.
<i>Tyto novaehollandiae</i>	Masked Owl	V		Recorded over approximately 90% of NSW, excluding the most arid north-western corner. Most abundant on the coast but extends to the western plains. Dry eucalypt forests and woodlands from sea level to 1100 m.	1	Potential - suitable habitat within the site.
<b>Flora</b>						
<i>Acacia bynoeana</i>	Bynoe's Wattle		V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	1	Unlikely - suitable habitat not identified within the site.
<i>Acacia clunies-rossiae</i>	Kanangra Wattle		V	In NSW, occurs in Kowmung and Coxs River areas entirely within Kanangra-Boyd and Blue Mountains National Parks. Dry sclerophyll forest on skeletal soils on rocky slopes, or on alluvium along creeks.	1	Unlikely - suitable habitat not identified within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
<i>Acacia pubescens</i>	Downy Wattle		V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	4	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V		Dry sclerophyll forest. Georges River to Hawkesbury River in the Sydney area (limited to the Hornsby Plateau area), and north to the Nelson Bay area of NSW. Also Coalcliff in the northern Illawarra.	2	Unlikely - the presence of this species was not identified within the site.
<i>Darwinia biflora</i>	-		V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas, in an area bounded by Maroota, North Ryde, Cowan and Kellyville. Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	7348	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.
<i>Darwinia peduncularis</i>			V	Disjunct populations in coastal NSW with a couple of isolated populations in the Blue Mountains. Rocky outcrops on sandy, well drained, low nutrient soil over sandstone.	1	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.
<i>Dillwynia tenuifolia</i>		E2, V		Mainly on the Cumberland Plain, but also Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains. Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest, transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland, and	2	Likely - the presence of this species was not identified although suitable habitat was identified within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				disturbed escarpment woodland on Narrabeen sandstone.		
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V		Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Sclerophyll forest, scrubs and swamps. Most habitats have a strong shale soil influence.	442	Unlikely - the presence of this species was not identified (conspicuous species).
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark		V	Narrow band from the Raymond Terrace area south to Waterfall. Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	1	Unlikely - the presence of this species was not identified (conspicuous species).
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint		V	New England Tablelands from Nundle to north of Tenterfield. Dry grassy woodland, on shallow soils of slopes and ridges.	4	
<i>Eucalyptus scoparia</i>	Wallangarra White Gum	E1	V	In NSW it is known from only three locations near Tenterfield. Open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes.	1	Unlikely - the presence of this species was not identified (conspicuous species) and suitable habitat was not identified within the site.
<i>Galium australe</i>	Tangled Bedstraw	E1		Recorded historically in the Nowra (Colymea) and Narooma areas; extant in Nadgee Nature Reserve, south of Eden. Unconfirmed records from the Sydney region. Turpentine forest and coastal Acacia shrubland in NSW. Elsewhere sand dunes, sand spits, shrubland and woodland.	5	Unlikely - the presence of this species was not identified (conspicuous species) and the site is not within the species' distribution.
<i>Genoplesium baueri</i>	Bauer's Midge Orchid		E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	6	Potential - the presence of this species was not identified (conspicuous species) however there are known records within the site.
<i>Genoplesium plumosum</i>	Tallong Midge Orchid	E4A	E	Known only around Tallong and a site in Morton National Park 8.5 km south-east of Wingello. Heathland, generally dominated	1	Unlikely - the presence of this species was not identified within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				by <i>Kunzea parvifolia</i> (Violet Kunzea), <i>Calytrix tetragona</i> (Common Fringe-myrtle) and <i>Dillwynia</i> spp. (parrot-peas), on very shallow soils, often on sandstone conglomerate rock shelves.		
<i>Grammitis stenophylla</i>	Narrow-leaf Finger Fern	E1		In NSW it has been found on the south, central and north coasts and as far west as Mount Kaputar National Park near Narrabri. Rainforest and moist eucalypt forest, usually near streams, on rocks or in trees.	7	Unlikely - suitable habitat not identified within the site.
<i>Grevillea caleyi</i>	Caley's Grevillea	E4A	E	Restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. Open forest, generally dominated by <i>Eucalyptus sieberi</i> and <i>E. gummifera</i> on a ridgetop, in association with laterite soils.	1	Unlikely - suitable habitat not identified within the site.
<i>Haloragodendron lucasii</i>		E1	E	Confined to a very narrow distribution on the north shore of Sydney. Dry sclerophyll forest and low open woodland on sheltered slopes near creeks, in moist sandy loam soils.	1	Unlikely - the presence of this species was not identified within the site
<i>Hibbertia spanantha</i>	Julian's Hibbertia		CE	Endemic to NSW where it is restricted to three locations. Currently only known from around Sydney. Grows in forest with canopy species including <i>Eucalyptus pilularis</i> , <i>E. resinifera</i> , <i>Corymbia gummifera</i> and <i>Angophora costata</i> . The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. The soil is identified as a light clay occurring on a shale sandstone soil transition."	4	Unlikely - the presence of this species was not identified (conspicuous species) and the site is not within the species' distribution.
<i>Hibbertia superans</i>		E1		From Baulkham Hills to South Maroota in the northern outskirts of Sydney, and at one locality at Mount Boss, inland from Kempsey. Open woodland and	3	Unlikely - the presence of this species was not identified (conspicuous species) and the site is not

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				heathland, and appears to prefer open disturbed areas.		within the species' distribution.
<i>Lasiopetalum joyceae</i>		V	V	Restricted to the Hornsby Plateau south of the Hawkesbury River, between Berrilee and Duffys Forest. Heath on lateritic to shaley ridgetops over sandstone.	3	Unlikely - the presence of this species was not identified.
<i>Leptospermum deanei</i>	-		V	Hornsby, Warringah, Ku-ring-gai and Ryde LGAs in the Sydney region. Woodland, riparian scrub and open forest on lower hill slopes or near creeks, on sand or sandy alluvial soil.	13	Potential - not identified within the site however records exist within the study area.
<i>Macadamia integrifolia</i>	Macadamia Nut	P	V	Not known to occur naturally in the wild in NSW; recorded from Camden Haven but it is not known if the tree was cultivated or growing naturally. Drier subtropical rainforest.	12	Unlikely - the presence of this species was not identified.
<i>Melaleuca biconvexa</i>	Biconvex Paperbark		V	Only found in NSW, populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Damp places, often near streams or low-lying areas on alluvial soils.	1	Unlikely - the presence of this species was not identified.
<i>Melaleuca deanei</i>	Deane's Paperbark		V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Heath on sandstone.	44	Unlikely - the presence of this species was not identified (conspicuous species) and the site is not within the species' distribution.
<i>Persoonia hirsuta</i>	Hairy Geebung		E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	3	Unlikely - the presence of this species was not identified (conspicuous species) within the site.
<i>Pimelea curviflora</i> var. <i>curviflora</i>	-		V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over	23	Unlikely - the presence of this species was not identified (conspicuous species) within the site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution and Habitat	Number of records within 5km	Likelihood of occurrence on site
				sandstone and shale/sandstone transition soils on ridgetops and upper slopes.		
<i>Pterostylis nigricans</i>	Dark Greenhood	V		North-east NSW north from Evans Head, and in Qld. Coastal heathland with <i>Banksia ericifolia</i> (Heath Banksia), and lower-growing heath with lichen-encrusted soil surfaces, on sandy soils.	1	Unlikely - the presence of this species was not identified (conspicuous species) within the site.
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	V	E	In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Sclerophyll forest in shallow to deep loams.	14	Unlikely - the presence of this species was not identified (conspicuous species) within the site.
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE		Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm.	7	Unlikely - the presence of this species was not identified within the site.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly		V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	14	Unlikely - the presence of this species was not identified within the site.
<i>Tetradlea glandulosa</i>		V		Found from Sampons Pass (Yengo NP) in the north to West Pymble (Lane Cove NP) in the south. The eastern limit is at Ingleside (Pittwater LGA) and the western limit is at East Kurrajong (Wollemi NP). Heath, scrub, woodlands and open forest on upper-slopes and mid-slope sandstone benches. Soils generally shallow, consisting of a yellow, clayey/sandy loam.	452	Potential - the presence of this species was not identified within the site, however there are records near the study area.

