St George Illawarra Dragons CHPC – Flora and Fauna Assessment

Bridge42 Pty Ltd on behalf of St George Illawarra Rugby League Football Club

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Abbreviations

Abbreviation	Description
AIA	Arborists Impact Assessment
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BS Act	NSW *Biosecurity Act 2015*
BV map	Biodiversity Values Map
CHPC	Community & High-Performance Centre
DA	Development Application
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DPE	Department of Planning and Environment
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FFA	Flora and Fauna Assessment
FM Act	NSW *Fisheries Management Act 1994*
GIS	Geographic Information System
GHFF	Grey-headed Flying-fox
HBT	Hollow bearing tree
KMA	Koala Management Area
LEP	Local Environmental Plan
LGA	Local Government Area
LLS Act	NSW *Local Land Service Act 2013*
MNES	Matters of National Environmental Significance
NSW	New South Wales
PCT	Plant Community Type
PMST	Protected Matters Search Tool
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community
UOW	University of Wollongong
WCC	Wollongong City Council
WM Act	NSW *Water Management Act 2000*

Executive Summary

Eco Logical Australia Pty Ltd (ELA) was engaged by Bridge42 on behalf of St George Illawarra Rugby League Football Club to prepare a Flora and Fauna Assessment (FFA) for the proposed development of a Community and High-Performance Centre (CHPC) on the northern portion of the University of Wollongong's (UOW) Innovation Campus in North Wollongong (the 'subject site'). The subject site is located within the Wollongong Local Government Area (LGA). This FFA will form part of a Development Application (DA) to Wollongong Council for the proposed development and be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This version is an updated version of a FFA provided to St George Illawarra Rugby League Football Club on 6 August 2023, and brings the assessment of impacts in line with those outlined in the Arborists Impact Assessment (AIA) dated 15 August 2023 (Tree Survey 2023).

The FFA will address the potential impact of the proposed development on threatened species, populations and ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The report sets out the legislative context, methods used, impacts to the environment and recommendations to minimise these impacts.

The BC Act provides a framework for addressing impacts on biodiversity, including whether a proposed development requires entry into the NSW Biodiversity Offsets Scheme (BOS), for which a Biodiversity Development Assessment Report (BDAR) is required. A BDAR is not required for the proposed development as the following thresholds, which trigger entry into the BOS, are not exceeded:

- Native vegetation area clearing threshold, which is based on the minimum lot size of the proposed development site. In this case, the Wollongong Local Environment Plan (LEP) 2009 Lot Size Map does not specify a minimum lot size for the subject site so the smallest actual lot size within the subject site (3.05 ha) is used to determine the area clearing threshold. The threshold, therefore, is clearing more than 0.5 ha of native vegetation on land with minimum lot size of 1 to 40 ha. A total of 0.45 ha 'planted native' vegetation will be removed as part of the development proposal. No native Plant Community Types (PCTs) will be removed.
- Impacts on land included on the Biodiversity Values (BV) Map. The subject site does not contain land identified on the BV Map (accessed July 2023).
- Significantly affecting threatened species, populations or ecological communities following the application of the Test of Significance in accordance with Section 7.3 of the BC Act. No threatened species, populations or ecological communities will be significantly affected by the proposed development.

The assessment involved a literature and database review to determine ecological values of the subject site, including threatened species, populations or communities that could occur within the subject site. This is presented as a Likelihood of Occurrence table (Appendix A).

An initial and follow up field survey (due to an amended layout) of the subject site was conducted to identify and map the extent of vegetation types, identify the occurrence of any threatened flora and fauna species, and identify habitat features that may be utilised by threatened fauna species.

The field surveys identified three vegetation communities within the subject site:

- One native Plant Community Type (PCT): *4049 – South Coast Floodplain Grassy Swamp Forest,* which exists in the subject site as a narrow, linear patch (0.24 ha) along the south east boundary.
- Planted native – which consisted of a number of mature canopy species and occasional shrub species that have been planted around the boundary of the subject site surrounding the fields, and several planted trees and shrubs occurring sporadically throughout the subject site, including around the existing buildings, car parks and landscaped garden beds which also include some planted native ground layer species.
- Exotic grassland – which covers the majority of the subject site in the form of sporting fields and mown lawns.

PCT 4049 is associated in part with a Threatened Ecological Community (TEC): *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (Swamp Oak Floodplain Forest), which is listed as Endangered under the NSW BC Act. It is also associated with the equivalent Commonwealth listed TEC: *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* which is also listed as Endangered under the EPBC Act. The patch of *Casuarina glauca* identified as PCT 4049 within the subject site, however, does not meet the condition criteria to be Coastal Swamp Oak Forest under the EPBC Act. Whilst the BC Act does not have condition criteria, it is likely that the PCT 4049 vegetation does represent Swamp Oak Floodplain Forest in a low condition under the BC Act.

No threatened flora species were identified during the field surveys.

One threatened fauna species, *Pteropus poliocephalus* (Grey-headed Flying-fox (GHFF)) was identified as having 'potential' to occur. There is one active GHFF camp recorded approximately 5 km away and one inactive camp approximately 3km from the subject site. The trees planned for removal within the subject site are potential foraging habitat for the GHFF. A Test of Significance under Section 7.3 of the BC Act was applied to the GHFF which found that the proposed development is unlikely to constitute a significant impact on this species. A Significant Impact Criteria assessment under the EPBC Act was also applied and concluded that the proposed development is unlikely to have a significant impact on the GHFF and an EPBC Act referral is not required. No other threatened fauna species were detected during the field surveys.

Four species of microbat were assessed as having 'potential' likelihood to occur as they forage on insects either in the open and along the forest edge in a wide range of habitats. As they are wide-ranging species, the subject site presents potential, though marginal, foraging habitat. The use of flood lighting for night time training on one of the proposed sports fields may have an impact on these species. A Test of Significance under Section 7.3 of the BC Act was applied to these microbats with regard to the impact of flood lighting on foraging habitat. This found that the proposed development is unlikely to constitute a significant impact on these species, due to the application of spill lighting requirements in accordance with AS4282, which will limit the impact of lighting to the sports field with minimal impact to the adjacent bordering vegetation.

The subject site is mapped in three Divisions under the *State Environmental Planning Policy (SEPP) Resilience and Hazards (2021), Chapter 2: Coastal Management*. However, the proposal is unlikely to directly affect these coastal areas.

The subject site is within Wollongong LGA and therefore the *State Environmental Planning Policy – Koala Habitat Protection 2021* (SEPP KHP) applies. However, the subject site is not likely to constitute *highly suitable habitat* or *core koala habitat* under the SEPP KHP 2021. The proposed development would be likely to have low or no impact on koalas.

A number of strategies to avoid, minimise and mitigate ecological impacts as a result of the development, during construction and operation, have been recommended in the 'mitigation measures' chapter.

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by Bridge42 Pty Ltd on behalf of St George Illawarra Rugby League Football Club to prepare a Flora and Fauna Assessment (FFA) for the proposed development of a Community & High-Performance Centre (CHPC) on the northern portion of the University of Wollongong's (UOW) Innovation Campus in North Wollongong (the 'subject site), as detailed in the provided document: Request for Proposal – Ecological Consultant (Ref 21-014/3/17). The subject site is located wholly within the Wollongong Local Government Area (LGA). This FFA would accompany a development application (DA) which would be assessed by Wollongong Council under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This version is an updated version of a FFA provided to St George Illawarra Rugby League Football Club on 6 August 2023, and brings the assessment of impacts in line with those outlined in the Arborists Impact Assessment (AIA) dated 15 August 2023 (Tree Survey 2023).

This report describes likely impacts on native vegetation, threatened species, populations and ecological communities listed under the *NSW Biodiversity Conservation Act 2016* (BC Act) and *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and associated habitat features as a result of the development. The impact assessment in this report is based on information gathered from database searches and field investigations. The report sets out the legislative context, methods used, impacts to the environment and recommendations to minimise these impacts.

1.1. Site description and proposed development

The subject site consists of Lot 2 DP 1172135 and a large portion of Lot 1 DP 1172135 (Figure 1). The subject site is comprised of heritage listed buildings, a carpark, road, foot-path, soccer field and other multi-use fields, surrounded by a strip of vegetation in patches along the boundary. The subject site is bounded by Squires Way to the east, University of Wollongong's (UOW) Campus East Accommodation and Innovation Campus to the south and residential properties to the west and north. Vehicle access to the site is via Innovation Way from either the west or south.

The proposed development of the subject site involves the:

- relocation of the existing buildings
- removal of existing carpark, footpath and some vegetation
- construction of a new carpark, building, two football fields and associated flood lighting (Figure 2, Figure 3 and Figure 4).

The subject site is zoned as SP1 Special Activities under the *Wollongong Local Environmental Plan* (LEP) 2009 (Figure 5).

1.2. Key definitions

The following key terms and definitions, as per NSW Department of Environment and Conservation (DEC) (2004), are used in this FFA:

- *Proposed development* – the proposed development as described in section 1.1
- *Subject site* – the area directly affected by the proposed development as shown in Figure 1.

1.3. Purpose of this report

This Flora and Fauna Assessment aims to:

- Identify and describe biodiversity values of the site including threatened flora and fauna species, populations, ecological communities, as well as migratory species and their habitats, that may occur within the subject site.
- Assess the impact of the proposed development on threatened flora and fauna species, populations and ecological communities, and migratory species likely to occur in the subject site through assessment of significance in accordance with the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Recommend measures to avoid, reduce or mitigate the impacts of the proposal on native flora and fauna and their habitats.

Figure 1: Location of the subject site

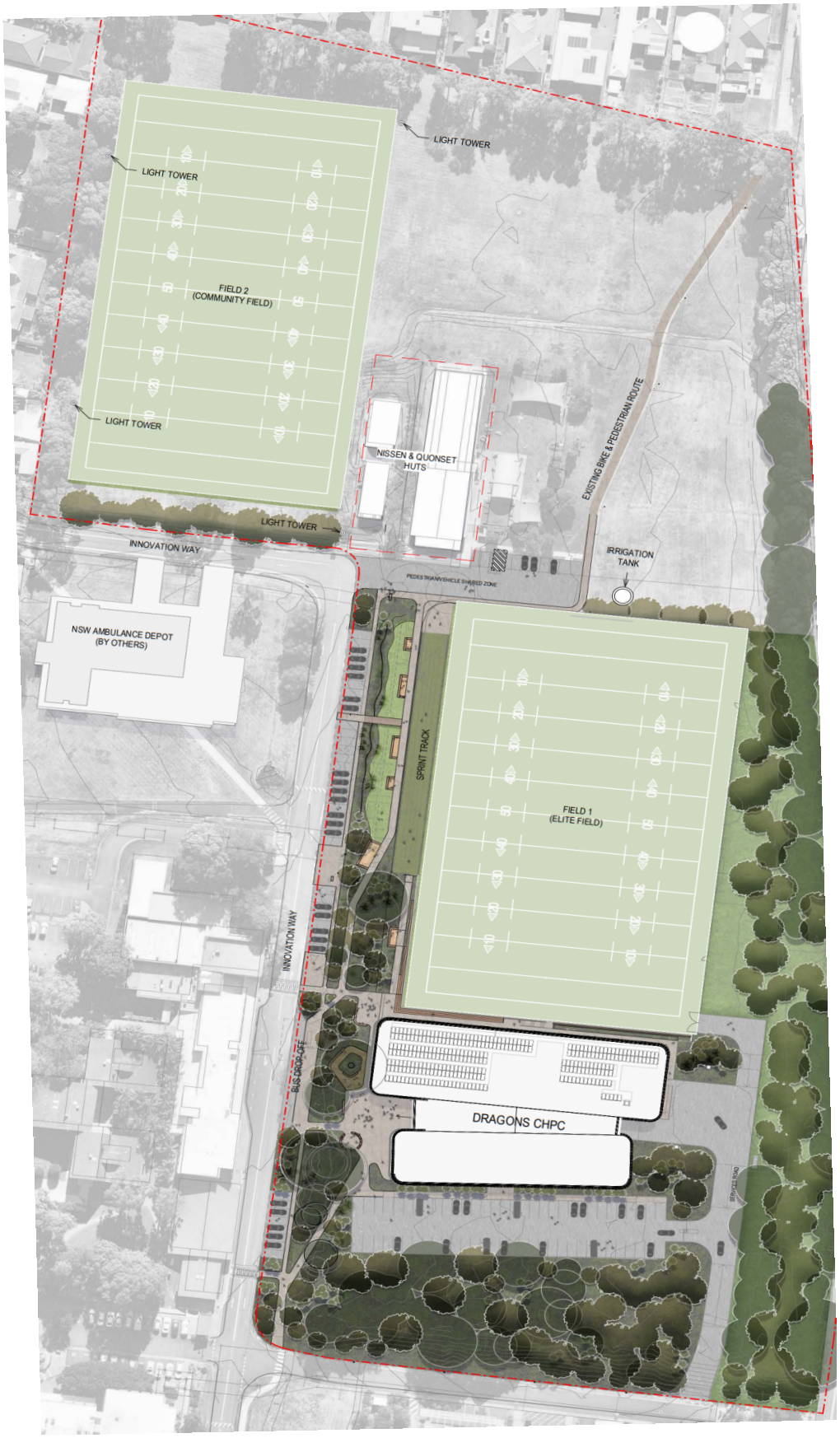

Figure 2: Indicative site plan including proposed football fields, new carpark and buildings

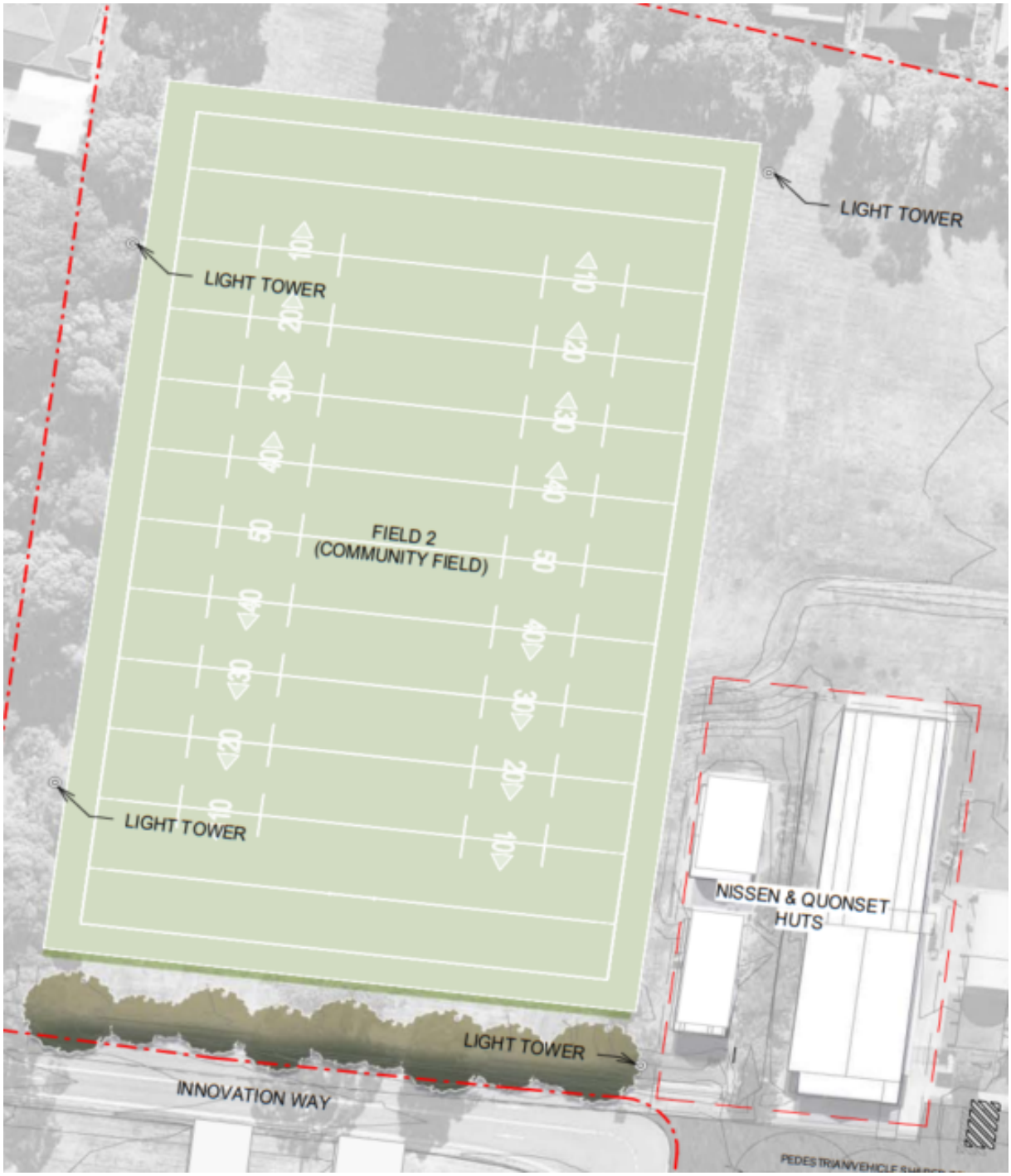

Figure 3: Lighting plan for Community Field 2

Figure 4: Scope of works within the subject site

Figure 5: Land zoning of the subject site (DPE 2023d)

2. Legislative Context

A summary of the legislative context of the FFA is provided in Table 1.

Table 1: Legislative context

Name	Relevance to the project
Commonwealth	
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) aims to protect Matters of National Environmental Significance (MNES) including wetlands of international importance, threatened species and communities and listed migratory species. An action that may or is likely to have a significant impact on MNES should be referred to the Commonwealth to determine whether it is a Controlled Action that requires approval from the Commonwealth. A protected matters search was conducted using a 5 km buffer around the subject site. There were four threatened ecological communities, 103 threatened species and 60 migratory species with the potential to occur within 5 km of the site. Results of the PMST searches are provided in Appendix A to determine their likelihood of occurrence within the subject site. Potential habitat for the Grey-headed Flying Fox is present on the subject site. Significant Impact Criteria was addressed in an assessment of significance as per the EPBC Act Guidelines (Appendix C). Due to the highly mobile nature of the Grey-headed Flying Fox and their ability to quickly colonise urban spaces, it is recommended that searches be undertaken prior to the works commencing and relocation considered if roosting bats are found. However, the proposed works are not expected to impact the species in any significant way.
State	
***Environmental Planning and Assessment Act 1979* (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 development proposals. The EP&A Act places a duty on the consent authority to adequately address a range of environmental matters including maintenance of biodiversity and the likely impact to threatened species, populations or ecological communities (under the BC Act– refer below). The proposed development is to be assessed under Part 4 of the EP&A Act.
***Biodiversity Conservation Act 2016* (BC Act)**	The BC Act outlines the assessment requirements to determine whether a proposed development (Part 4 of the EP&A Act) is likely to significantly affect threatened species or ecological communities, or their habitats under section 7.3 (test of significance) of the Act, and whether the Biodiversity Offsets Scheme (BOS) will be triggered. The triggers to enter the BOS include: • Clearing of native vegetation above the area threshold permitted for the minimum lot size (for the subject site, there is no minimum lot size listed for Lot 1 and 2 DP 1172135, therefore the minimum lot size is the size of the lots, 3.05 ha and 11.89 ha respectively. Therefore, the clearing threshold for both lots is 0.5 ha. • Impacts to land that is mapped as having high biodiversity value, as defined by the *Biodiversity Conservation Regulation 2017*, and mapped on the Biodiversity Values (BV) map • If the development is determined to have a significant impact on any threatened flora, fauna or ecological communities assessed through the application of s7.3 of the Act. There is potential foraging habitat within the subject site for the Grey-headed Flying-fox. Subsequently, a five-part test of significance under the BC Act guidelines was undertaken. It concluded that a significant impact to the species was unlikely to occur. The proposed works will not trigger the BOS as the affected area is less than 0.5 ha, the subject site is not mapped on the BV Map and the works are unlikely to have a significant impact on matters listed under this Act.

Name	Relevance to the project
Water Management Act 2000 **(WM Act)**	The project is not located within waterfront land and therefore does not require a Controlled Activity Approval under s91 of the WM Act.
Fisheries Management Act 1994 **(FM Act)**	The proposal does not involve harm to mangroves or other protected marine vegetation, dredging, reclamation or blocking of fish passage and therefore a permit under the FM Act is not required (DPI 2023).
Local Land Services Act 2013 **(LLS Act)**	The *Local Land Services Act 2013* (LLS Act) regulates the clearing of native vegetation on Rural land but only when the activity is permitted without Council consent. Under Section 60O of the LLS Act, the clearing of vegetation is authorised by other legislation if it is authorised by a development consent under Part 4 of the EP&A Act. The LLS Act is not applicable to this proposal as this development requires consent.
Biosecurity Act 2015 **(BS Act)**	Under the Biosecurity Act, 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.
Environmental Planning Instruments	
State Environmental Planning Policy (Biodiversity and Conservation) 2021	This new SEPP came into effect on March 1 2022 and among others has consolidated the following SEPPs: • Vegetation in Non-Rural Areas 2017 (now chapter 2) • Koala Habitat Protection SEPP 2021 (SEPP KHP) (now chapter 4) Both of these are listed separately below in context to the subject site.
Chapter 2 – Vegetation in Non-Rural Areas	Chapter 2 – *Vegetation in Non-Rural Areas* aims to protect biodiversity values of trees and other vegetation in non-rural areas of the state. The SEPP applies to any development that does not require consent. As the proposed development requires consent from Wollongong City Council, the Vegetation in Non-Rural Areas chapter of the SEPP is not relevant.
Chapter 4 – State Koala Habitat Protection 2021	Chapter 4 – *Koala Habitat Protection 2021* (KHP 2021) (DPE 2023e): aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. The development control provisions of the KHP apply to development applications relating to land within a council listed in Schedule 2 and: 1. *Where there is an approved Koala Plan of Management for the land* a. *The development application must be consistent with the approved Koala Plan of Management that applies to the land.* 2. *Where there is no approved Koala Plan of Management for the land, if the land* a. *Has an area of more than 1 hectare, or* b. *Has, together with any adjoining land in the same ownership, an area of more than 1 hectare, whether or not the development application applies to the whole or only the part of the land.* The subject site is within the Wollongong LGA which is listed in Schedule 2 the KHP. There is no approved Koala Plan of Management for the land, and the subject site is part of a larger lot that is >1 ha. Therefore, the KHP 2021 applies to this proposed development, although in relation to 'core koala habitat' the vegetation being directly impacted by the proposed development would not be considered *highly suitable habitat* and therefore the development will not likely meet the criteria of this SEPP. This is discussed further in Section 5.5.
State Environmental Planning Policy (Resilience and Hazards)	The State Environmental Planning Policy (Resilience and Hazards) 2021 – Chapter 2: Coastal Management (DPE 2023g) applies to land in the coastal zone. The aim of this SEPP is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a

Name	Relevance to the project
2021, Chapter 2: Coastal Management	manner consistent with the objects contained within the SEPP including the management objectives for five coastal management areas which are as follows: a. the coastal wetlands and littoral rainforests area, b. the coastal wetlands and littoral rainforests proximity area, c. the coastal vulnerability area, d. the coastal environment area, e. the coastal use area. The subject site intersects land mapped as b., d., and e. However, the area of intersection has been cleared and is highly modified due to the construction of an existing sports fields, childcare centre, carpark and footpath. The State Environmental Planning Policy (Resilience and Hazards) 2021, Chapter 2: Coastal Management lists criteria for assessing development in each coastal zone. These are discussed further in Section 5.6 (Table 3– Table 5). It is likely the development can meet those criteria.
Wollongong Local Environment Plan (LEP) 2009	The subject site is currently zoned as SP1 Special Activities (Innovation Campus). The site is located within UOW's Innovation Campus area. Clause 7.15 of the LEP states: 1. The objectives of this clause are as follows— a. to permit the establishment of a research and development campus that includes a hotel, student and campus related residential accommodation and necessary support services and facilities, b. to provide an area where enterprises that carry out research and development as an integral part of their operations can be located, c. to promote collaborative research and development between users of the land to which this clause applies and the University of Wollongong and other enterprises in the Illawarra region, d. to promote links between the University of Wollongong's research activities and the initiatives of the business community, e. to ensure that the development of the site is undertaken in a manner that demonstrates design of a high quality with respect to the context of the site, scale, built form and density of the development, resources, energy and water efficiency, landscape, amenity, safety and security, social dimensions and aesthetics, f. to ensure that development of the site is in harmony with the coastal and foreshore landscape, g. to permit the provision of university related facilities including student and campus related residential accommodation and support services, incidental or ancillary to research and development activities. 2. This clause applies to land shown as being within the Wollongong innovation campus on the Wollongong Innovation Campus Map. 3. Development consent must not be granted for the subdivision of land to which this clause applies unless the consent authority is satisfied that the subdivision is for the purpose only of defining the boundaries of lots that are to be the subject of leases. 4. Development consent must not be granted to development for the purposes of building on land to which this clause applies if the gross floor area of the building would be greater than 135,000 square metres.
Wollongong City Council Development Control Plan (DCP)	This DCP sets out the proposed development objectives and design principles for the Wollongong LGA including the subject site. The following chapters must be adhered to in the proposed development: • Chapter D14 Wollongong Innovation Campus requires: - To preserve any areas of 'Swamp Oak Forest'

Name	Relevance to the project
	- To maintain the appropriate native vegetative species derived from the plant species list established from Puckeys Estate - To incorporate into the Innovation Campus site, buildings and infrastructure best practice Ecologically Sustainable Development strategies. • Chapter E17 Preservation and Management of Trees and Vegetation requires - Removal of significant native vegetation only be carried out with Council approval - Protection and enhancement of native vegetation, habitat for native fauna and biodiversity - Conservation of trees of ecological, heritage, aesthetic and cultural significance - Conservation of significant stands of remnant vegetation - Ensures that any new development considers and maximises the protection of existing vegetation in the site planning, design, development, construction and operation of the development. • Chapter E18 Threatened Species Impact Assessment requires: - A Flora and Fauna Assessment to be lodged with a development application where there is potential impact of any threatened species.

3. Methods

3.1. Literature and database review

A desktop review of readily available databases pertaining to the ecology and environmental features of the subject site and surrounding area, and existing vegetation mapping was conducted to identify records of threatened species, populations and communities and their potential habitat. Databases and literature reviewed included:

- BioNet (Atlas of NSW Wildlife) database search (5 km) for threatened species, populations and TECs listed under the BC Act 2016 (DPE 2023b) (accessed 24 July 2023)
- Protected Matters Search Tool (PMST) (5 km) for threatened and migratory species, populations and TECs listed under the Commonwealth EPBC Act (DCCEEW 2023b) (accessed 24 July 2023)
- National flying fox monitoring viewer for flying fox camps in the vicinity (DCCEEW 2023a)
- Existing vegetation mapping (DPE 2022) to assess the extent of native vegetation, including mapped TECs listed under the BC Act and / or EPBC Act
- Biodiversity Values Map (DPE 2023a)
- NSW Department of Planning and Environment ePlanning Viewer (DPE 2023d)
- Relevant State Environmental Planning Policies (SEPPs)
- Wollongong Development Control Plan (DCP)
- Local government legislation and NSW planning instruments.

Aerial photography (Google Maps and Google Earth) of the subject site and surrounds were also used to investigate the extent of vegetation cover and landscape features. In addition, relevant Geographic Information System (GIS) datasets (soil, geology, drainage) were reviewed.

Results from both the BioNet and the PMST online searches were combined to produce a list of threatened species, populations and ecological communities that may occur within the subject site. These are presented in a table of Likelihood of Occurrence in Appendix A.

3.2. Field surveys

A field survey was conducted on 29 June 2022 by ELA ecologist Melaina Chapman for a total of 5 person hours. The conditions were sunny and approximately 15-20 degrees Celsius. Data was collected using AvenzaMaps application on an iPhone.

A follow-up field survey was conducted on 12 July 2023 by ELA senior botanist Bronwyn Callaghan for a total of 3 person hours. The conditions were sunny and approximately 16-20 degrees Celsius. This field survey focused on an additional area to the south of the initial subject site, based on an amended layout of the overall facility.

The field surveys aimed to assess the following within the subject site:

- Identify and map vegetation present, including validation of existing vegetation mapping and determining presence of native Plant Community Type (PCT) and their condition
- Threatened flora and fauna habitat assessment, including identification and mapping of habitat features such as hollow bearing trees (HBT),

- Record any opportunistic fauna sightings.

3.2.1. Vegetation communities

To assist in determining the extent and condition of existing vegetation, an assessment was conducted across the subject site. This included the identification of patches of different vegetation types, including the species composition and structure of each patch. Dominant and indicative flora species were recorded, along with vegetation structure (stratum heights and covers). These components were then used to identify if any PCTs were present within the subject site.

3.2.2. Threatened fauna and habitat assessment

Threatened species habitat features, such as hollow-bearing trees (HBTs), nests, heavy woody debris, waterbodies, culverts and rock outcrops, were identified and mapped spatially using AvenzaMaps application on an iPhone. Targeted surveys for HBTs were conducted and mapped within the subject site. Any opportunistic fauna sightings were recorded during the field surveys.

4. Results

4.1. Literature and database review

4.1.1. Previously mapped vegetation

There are no previously mapped vegetation types within the subject site (DPE 2022). One native PCT has been mapped previously in close proximity to the subject site (DPE 2022) (Figure 6) The PCT is as follows:

- **PCT 4049** – *South Coast Floodplain Grassy Swamp Forest*

PCT 4049 is associated with the TECs listed in Table 2. The association is described as 'in part', meaning the occurrence of the PCT may not always conform to the TEC.

Table 2: Plant community types (PCT) within the subject site associated with threatened ecological communities (TEC)

PCT ID	Associated TEC Name	BC Act Status	EPBC Act Status	TEC fit status
4049	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E	-	Part
	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	-	E	Part

4.1.2. Threatened species

A search of the NSW BioNet Atlas database (DPE 2023b) was undertaken on 24 July 2023. A total of 71 threatened species were recorded within a 5 km radius of the subject site (Figure 7 and Figure 8). These threatened species records comprised:

- 48 species of birds
- 12 species of mammals
- One species of amphibian
- Three species of reptiles
- Seven flora species.

A search of the PMST (DCCEEW 2023b) within a 5 km radius of the subject site was undertaken on 24 July 2023 and returned the following Matters of National Significance (MNES) for consideration:

- four listed TECs
- 103 threatened species
- 60 migratory species.

Records of *Pteropus poliocephalus* (Grey-headed Flying-fox) occur in proximity to the subject site. The closest recorded Grey-headed Flying-fox camp is located approximately 5 km from the subject site, to the south, in Figtree (Camp 342). Another camp (Camp 229) is listed closer (approximately 3km) (Figure 7), in Balgownie, however, this camp is currently listed as un-inhabited (DCCEEW 2023a).

The subject site is mapped under the City of Wollongong LGA and therefore is subject to SEPP (Koala Habitat Protection) 2021 in the South Coast Koala Management area (DPE 2023e).

Other threatened species recorded previously within 500 m of the subject site includes the threatened fauna species *Ardenna pacifica* (Wedge-tailed Shearwater) and *Dasyurus maculatus* (Spotted-tail Quoll) and threatened flora species *Pultenaea aristata* (DPE 2023b). However, *A. pacifica* is a highly mobile species unlikely to be present in the subject site, the single sighting of *D. maculatus* was of a dead individual in 2019 and the single sighting of *P. aristata* is listed as being on Mt Keira Rd in the Metropolitan Special Area, which is a significant distance from the subject site.

4.1.3. Biodiversity Values

The subject site does not contain any vegetation mapped under the Biodiversity Values Map (BV Map) (Figure 9). Parts of the surrounding area are mapped under the BV Map, however, this area will not be directly impacted by the proposed development. Similarly, there are no areas mapped as Terrestrial Biodiversity under the Wollongong LEP within the subject site.

4.1.4. Coastal wetlands proximity and coastal use area

The State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 now includes the coastal management planning policies (previously *Coastal Management SEPP* (2018)), which can be found in *Chapter 2: Coastal Management* of the SEPP. The aims of this section are to 'manage development in the coastal zone and protect environment assets of the coast.' To achieve this, four types of coastal management areas have been defined on the NSW coast and guidelines to assess impact for each:

- Coastal wetlands and littoral rainforests area
- Coastal vulnerability area
- Coastal environment area
- Coastal use area.

The eastern side of the subject site is mapped as a Coastal Wetlands Proximity Area (Figure 10) (DPE 2023c). However, the majority of this area will be kept as a sports field under the proposed development and therefore is unlikely to significantly impact the biophysical, hydrological or ecological integrity of the adjacent coastal wetland nor significantly impact the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland. Therefore, as per Part 2.8 of the Resilience and Hazards SEPP (2021), further assessment is not required.

The majority of the subject site is mapped as Coastal Use Area (DPE 2023c), and the entire site is mapped as Coastal Environment Area (*Resilience and Hazards SEPP (2021) Chapter 2 – Coastal Management*). Subsequently, the proposed development must adhere to the requirements listed in both Division 3 and Division 4 of the SEPP to receive development consent. This is further addressed in Section 5.6.

4.1.5. Wollongong City Council Development Control Plan (DCP)

The Wollongong DCP applies to the subject site. The following chapters are applicable to this report and have been address in the Impact assessment in section 5.7:

- *Chapter D14 Wollongong Innovation Campus*
- *Chapter E17 Preservation and Management of Trees and Vegetation requires*
- *Chapter E18 Threatened Species Impact Assessment*

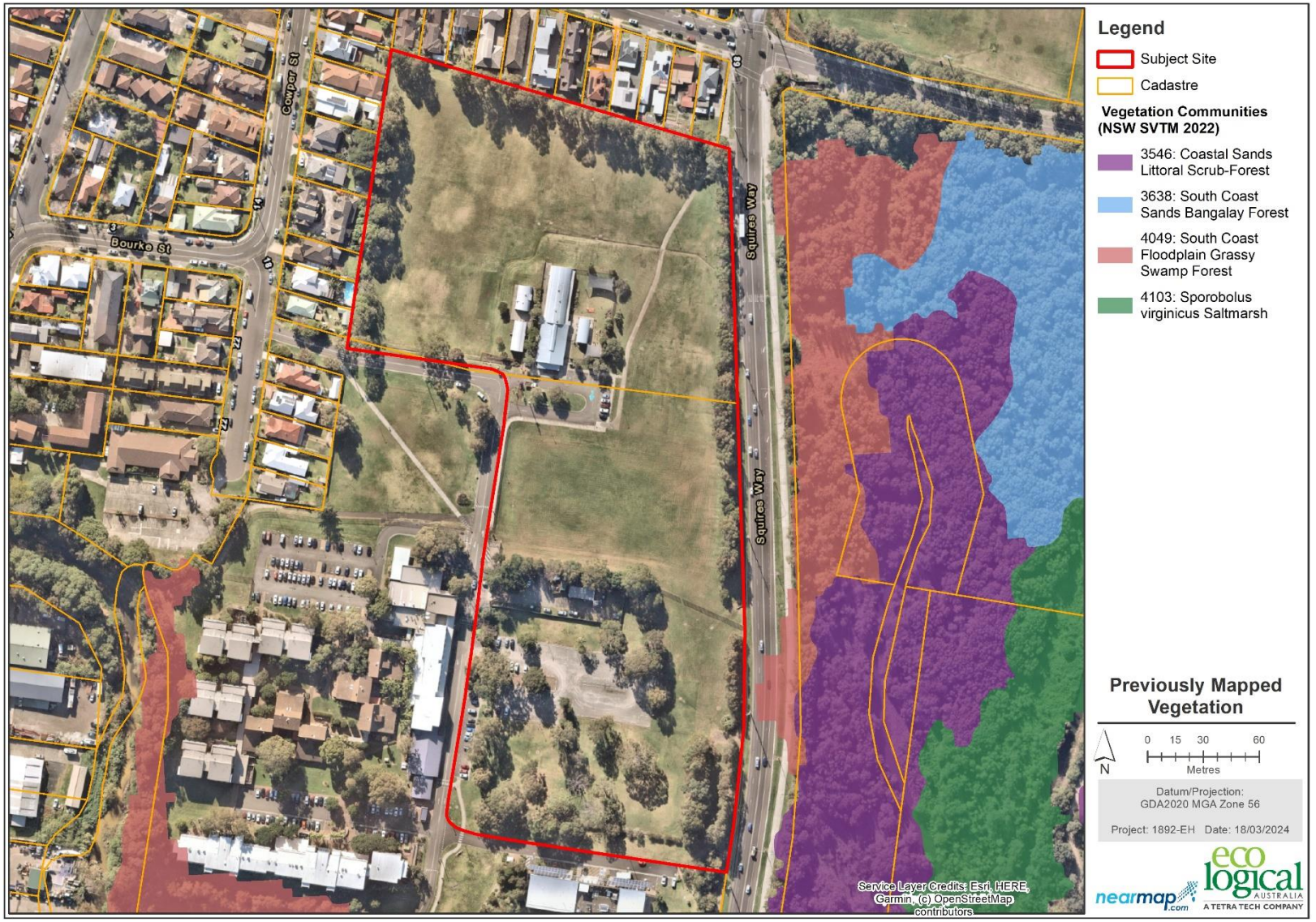

Figure 6: Previously mapped Plant Community Types (DPE 2022)

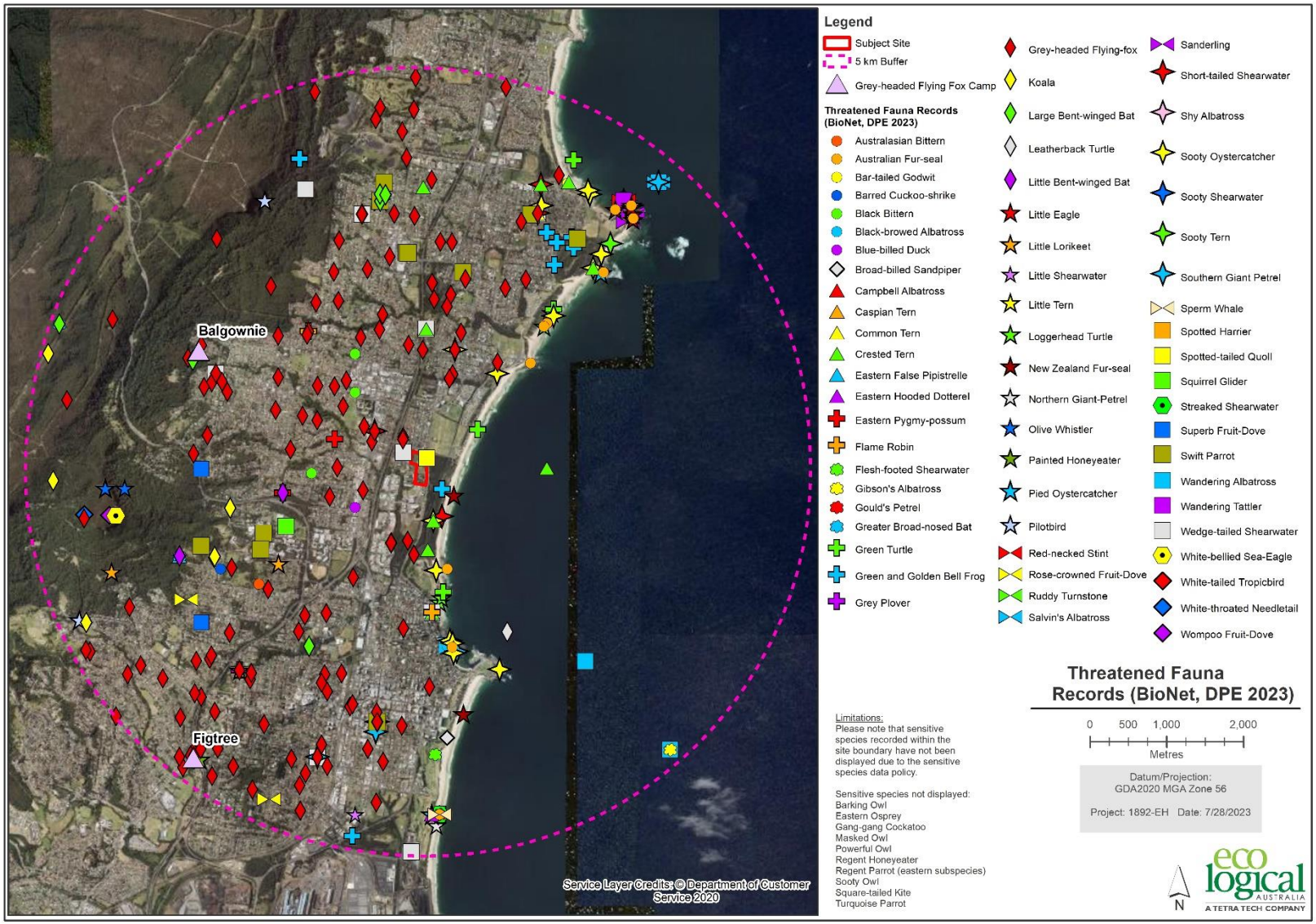

Figure 7: Threatened fauna records with 5km of the subject site (DPE 2023b and DCCEEW 2023a)

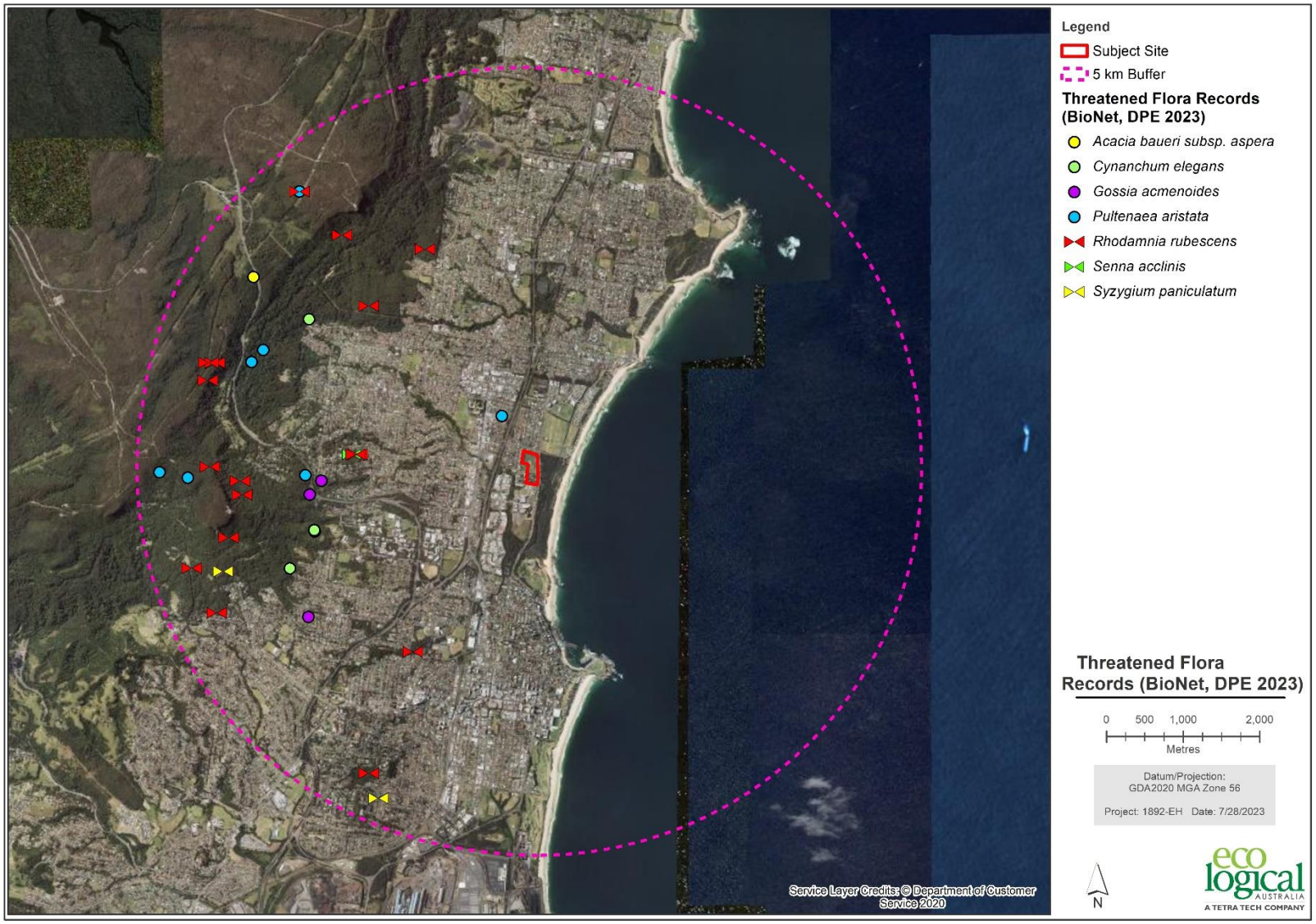

Figure 8: Threatened flora records within 5km of the subject site (DPE 2023b)

Figure 9: Mapped Biodiversity Values (DPE 2023a, WCC 2009b)

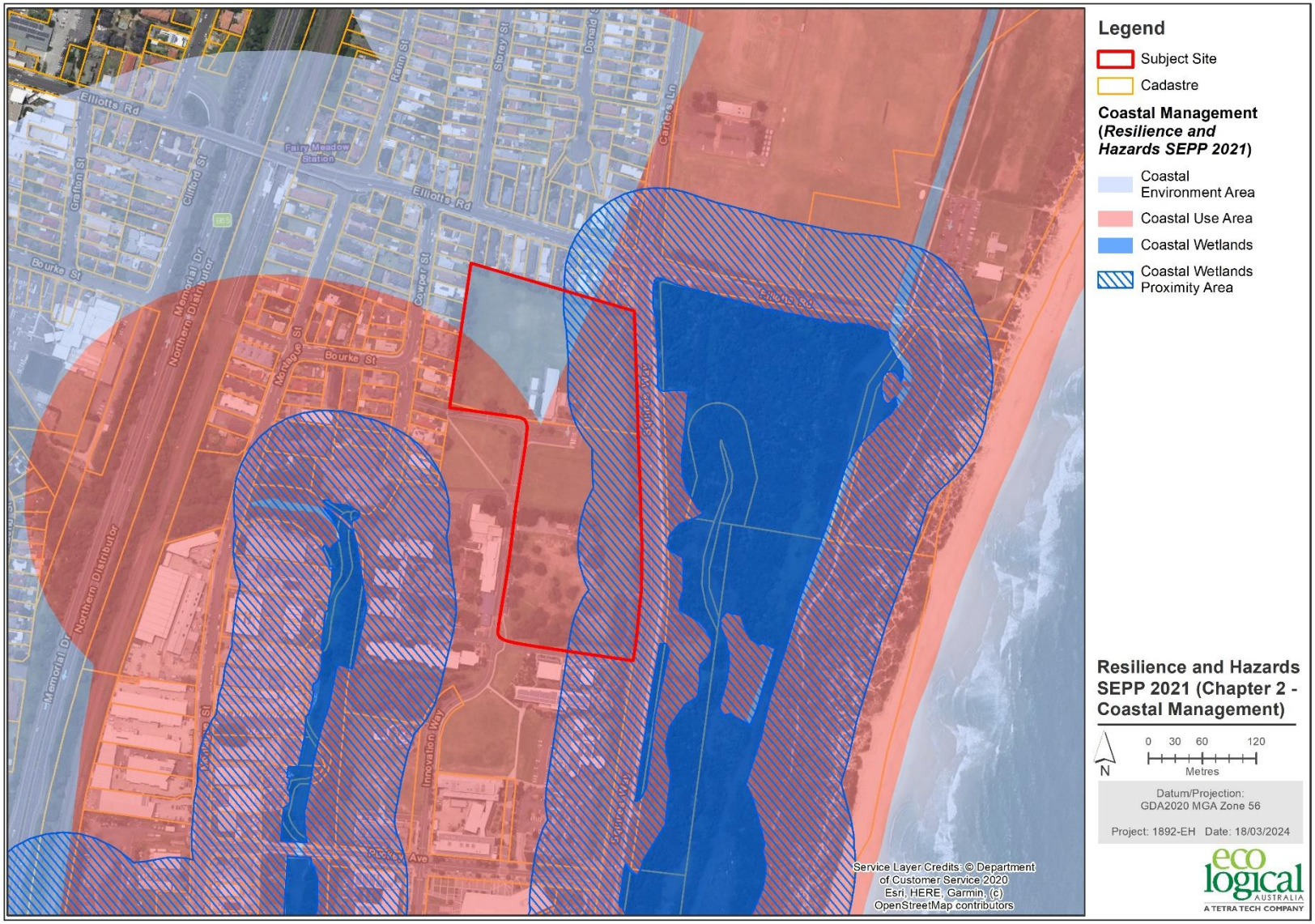

Figure 10: Coastal management areas within the subject site (DPE 2023c) (Resilience and Hazards SEPP 2021)

4.2. Field surveys

4.2.1. Vegetation communities

The field surveys confirmed the presence of one (1) PCT within the subject site:

- **PCT 4049** - South Coast Floodplain Grassy Swamp Forest (DPE 2022).

Other vegetation communities within the subject site included planted native vegetation and exotic grassland (Figure 12). Each vegetation community is detailed below.

4.2.1.1. PCT 4049 – South Coast Floodplain Grassy Swamp Forest

A narrow, linear patch of PCT 4049 was identified along the south-east boundary of the subject site (Figure 11). The eastern boundary lies directly across the road from Puckey's Estate, in which the vegetation adjacent to the road was previously also mapped as PCT 4049 (Figure 6). This PCT is typically dominated by *Casuarina glauca*, and occurs on slightly saline, coastal floodplain margins and headland soaks of the Sydney Basin and northern South East Corner Bioregions (DPE 2022). This PCT equates to 0.24 ha within the subject site.

Within the subject site, *Casuarina glauca* (Swamp Oak) was the common species in the canopy layer, ranging from 5-12m in height (Figure 12). The trees appeared to be of young to mid maturity, and given their linear and regular arrangement are most likely to have been planted with possibly some self-seeding from the patch across the road in Puckey's Estate. Other tree canopy species included *Eucalyptus botryoides* (Bangalay), *E. longifolia* (Woollybutt) and *E. tereticornis* (Forest Red Gum). Due to the highly disturbed nature of the subject site, from regular mowing and mulching of these patches, the mid-layer was almost non-existent, although some native shrub individuals occurred on the fringes and were most likely planted. Species included *Acmena smithii* (Common Lilly Pilly), *Callistemon viminalis* (Weeping Bottlebrush), *Melaleuca armillaris* (Bracelet Honey Myrtle) and *Podocarpus elatus*. The ground layer was sparse (approximately 10% cover) and dominated by exotic species including *Centaurium* sp., *Cenchrus clandestinus* (Kikuyu Grass), *Cyperus eragrostis* (Tall Flat-sedge) and *Ehrharta erecta* (Panic veldtgrass). The remaining area of the ground layer was saturated bare ground, mulch and leaf litter.

4.2.1.2. Planted Native Vegetation

A number of mature canopy species have been planted throughout the subject site. Planted native vegetation occurs around the north, north-west and north-east boundaries of the subject site, surrounding the fields, with an additional several trees planted sporadically around the existing Northern buildings, which also included two small raised garden beds (Figure 13). The southern portion of the subject site consists of planted native vegetation in larger, isolated patches. This vegetation community, termed 'Planted Native Vegetation' equates to 1.27 ha within the subject site (Figure 11).

The vegetation consisted primarily of a high diversity of native Australian trees, however some were not necessarily native to the Illawarra region. The most commonly planted trees were *Eucalyptus tereticornis* (Forest Red Gum), *E. microcorys* (Tallowwood), *E. botryoides* (Bangalay), *E. saligna* (Sydney Blue Gum) and *Casuarina glauca* (Swamp Oak). Other canopy tree species included *Agonis flexuosa* (Willow Myrtle), *Alphitonia excelsa* (Red Ash), *Brachychiton acerifolius* (Illawarra Flame Tree), *Corymbia maculata* (Spotted Gum), *Eucalyptus amplifolia* (Cabbage Gum), *E. eugenioides* (Thin-leaved

stringybark), *E. longifolia* (Woollybutt), *E. pilularis* (Blackbutt), *E. sideroxylon* (Red Ironbark), *Ficus macrophylla* (Moreton Bay Fig), *F. rubiginosa* (Rusty Fig), *Glochidion ferdinandi* (Cheese Tree), *Lophostemon confertus* (Queensland Brush Box) and *Syncarpia glomulifera* (Turpentine). The mid-layer was often absent, with the exception of an occasional large shrub species sporadically planted amongst the trees. Shrub species included *Acacia longifolia* (Sydney Golden Wattle), *Acronychia oblongifolia* (White Aspen), *Banksia integrifolia* (Coast Banksia), *Callistemon citrinus* (Crimson Bottlebrush), *C. viminalis* (Weeping Bottlebrush), *Dodonaea triquetra, Leptospermum laevigatum, Melaleuca armillaris, M. linearis, M. quinquenervia, Pittosporum undulatum, Podocarpus elatus, Syzygium australe* and *Waterhousea floribundum* (Weeping Lilly-pilly). The ground layer was dominated by exotic grasses and forbs, consistent with the species listed below in the exotic grassland vegetation community, however, the native species *Dianella caerulea* (Blue Flax-Lily), *Dichondra repens* (Kidney Weed) and *Lomandra longifolia* (Spiny-head mat-rush) was occasionally found around the bases of the trees and in garden beds.

4.2.1.3. Exotic Grassland

Exotic grassland covered the majority of the subject site (4.15ha) (Figure 11). The subject site consists of several 'field' areas, which are dominated by exotic lawn species including *Cenchrus clandestinus* (Kikuyu Grass), *Axonopus fissifolius* (Carpet Grass) and *Cynodon dactylon* (Couch Grass). Other exotic species present included common weeds such as *Asparagus aethiopicus* (Sprenger's asparagus), *Bidens Pilosa* (Cobblers pegs), *Ehrharta erecta* (Panic veldtgrass), *Hypochaeris radicata* (Cats Ear), *Paspalum dilatatum* (Paspalum), *Malva parviflora* (Mallow), *Rumex* sp. (Dock), *Senna pendula* (Cassia), *Sonchus oleraceus* (Common sowthistle), *Taraxacum officinale* (Dandelion) and *Trifolium repens* (White Clover) (Figure 14).

4.2.2. Threatened Ecological Communities

PCT 4049 is associated, in part, with *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, which is listed as Endangered under the BC Act and *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community* which is listed as Endangered under the EPBC Act. This community, commonly known as Swamp Oak Floodplain Forest, is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which *Casuarina glauca* (Swamp Oak) is the dominant species northwards from Bermagui.

To be listed as Swamp Oak Floodplain Forest under the EPBC Act, the following condition criteria must be met:

- The patch of vegetation is at least 0.5 ha
- Have a mostly native understorey with exotic species accounting for less than 50% of the vegetation cover.

The patch of *Casuarina glauca* trees identified as PCT 4049 does not meet the above criteria and therefore is not considered the Swamp Oak Floodplain Forest TEC under the EPBC Act.

The BC Act does not have condition criteria such as those of the EPBC Act, therefore the Final Determination for Swamp Oak Floodplain Forest (DoEE 1999) provides additional information to aid recognition of this community. The occurrence of PCT 4049 (Canopy of *Casuarina glauca*, *Eucalyptus*

botryoides, E. longifolia and *E. tereticornis*) within the subject site meets the Final Determination of this TEC (DoEE 1999) for the following reasons:

- The patch occurs on waterlogged or periodically inundated flats which is characteristic of the TEC and one of the primary determinations of Swamp Oak Floodplain Forest
- The patch occurs below 5m altitude and Swamp Oak Floodplain Forest also rarely occurs above 10m and never above 20m
- The patch has a dense to sparse tree layer in which *Casuarina glauca* (Swamp Oak) is the dominant species
- The presence of a high cover of weed species in the patch does not preclude the existence of Swamp Oak Floodplain Forest, as the Final Determination states that very few examples of Swamp Oak Floodplain Forest remain unaffected by weeds. The principal weed species affecting Swamp Oak Floodplain Forest include exotic species found in the subject site, including *Cyperus eragrostis* (Umbrella sedge), *Hydrocotyle bonariensis* (American pennywort), *Paspalum dilatatum* (Paspalum) and *Pennisetum clandestinum* (Kikuyu).
- Swamp Oak Floodplain Forest is known to occur in the Wollongong LGA.

4.2.3. Threatened fauna and habitat assessment

No opportunistic sightings of any threatened flora or fauna species were observed during the field surveys. No hollow bearing trees (HBT) were observed within the subject site.

Results of the BioNet and PMST searches are provided in Appendix A to determine likelihood of occurrence within the subject site. Only one threatened species was identified as being 'likely' to occur, *Pteropus poliocephalus* (Grey-headed Flying-fox (GHFF)). As discussed in Section 0, there is one active GHFF camp recorded approximately 5 km away and one inactive camp approximately 3km from the subject site (Figure 7). The trees planned for removal from the subject site are potential foraging habitat for the GHFF.

In addition to the GHFF, seven threatened fauna species were initially identified in the likelihood assessment as having 'potential' to occur: four microbats (*Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Miniopterus australis* (Little Bent winged bat), *Miniopterus orianae oceanensis* (Large Bent-winged bat), *Scoteanax rueppellii* (Greater Broad-nosed Bat)); *Glossopsitta pusilla* (Little Lorikeet); *Haliaeetus leucogaster* (White-bellied Sea-Eagle); and *Neophema pulchella* (Turquoise Parrot).

Habitat assessment found that the subject site contains no nesting habitat for the three bird species (i.e. no hollow bearing trees for the Little Lorikeet and Turquoise Parrot, and no large emergent Eucalypt trees next to water bodies that contain or could support a large stick nest for the White-bellied Sea-Eagle). No foraging habitat (open water) was present within the subject site for the White-bellied Sea-Eagle. The ground layer in both the PCT 4049 and planted native vegetation areas (predominantly saturated bare ground and leaf litter, with very sparse vegetation dominated by exotic weed species), and across the rest of the subject site (regularly mown sports field), represent very minimal foraging habitat for the Turquoise Parrot (seeds, grasses and herbaceous plants below woodland trees). Minimal foraging habitat was present within the subject site for the Little Lorikeet (flowering trees of *Eucalyptus* spp., *Angophora* spp., and *Melaleuca* spp. in open Eucalypt woodland and forest). For these reasons, these species have been listed as 'unlikely' in the likelihood table.

All four microbat species assessed as 'potential' likelihood to occur forage on insects either in the open and along the forest edge in a wide range of habitats. As they are wide-ranging species, the subject site may present potential, though marginal, foraging habitat. These species show a preference for roosting in tree hollows, caves, tunnels, abandoned mines, stormwater drains, culverts, and bridges, of which there were none within the subject site.

The field surveys also confirmed that no suitable habitat occurred within the subject site for any of the species that have been previously recorded within 500 m of the site (*Ardenna pacifica* (Wedge-tailed Shearwater), *Dasyurus maculatus* (Spotted-tail Quoll) and *Pultenaea aristata* (DPE 2023h)).

Several trees proposed for removal are considered 'Koala Use Species' under the South Coast Koala Management Area, which is discussed further in Section 5.5.

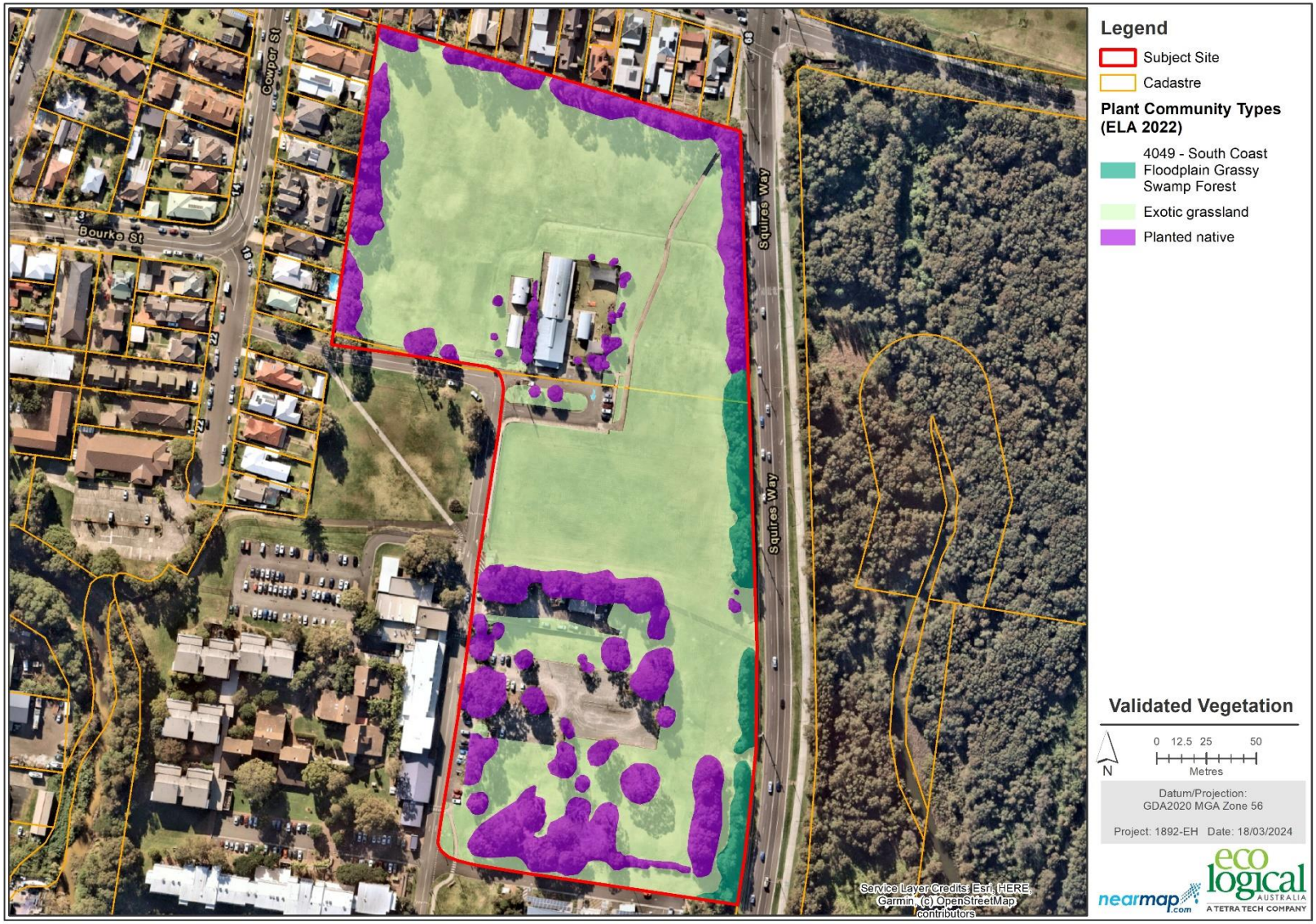

Figure 11: Validated vegetation communities within the subject site (ELA 2022)

Figure 12: PCT 4049 within the subject site

Figure 13: Planted native vegetation within the subject site

Figure 14: Exotic grassland within subject site

5. Impact Assessment

5.1. Direct impacts

5.1.1. Clearing of vegetation

The proposed development will result in the removal of 0.45 ha of planted native vegetation (Figure 15). The majority of vegetation planned for removal is situated in the southern portion of the subject site, currently existing as fragmented, isolated patches of planted native trees. A small number of isolated trees are to be removed in the northern portion of the subject site, which surround the existing northern buildings and along the northwest boundary. The footpath planned for removal runs beneath planted native vegetation in the north-east; as shown in the plans of Figure 4, no vegetation will be removed in this corner.

No remnant native vegetation communities will be directly impacted; the area of *PCT 4049 - South Coast Floodplain Grassy Swamp Forest* within the subject site is proposed to be retained. Given the lack of connectivity with intact remnant vegetation, removal of vegetation within the subject site will not result in the fragmentation or isolation of native vegetation.

5.1.2. Loss / modification of threatened species habitat

Habitat for threatened species within the subject site is poor and limited to marginal foraging habitat for highly mobile threatened birds and bats. Several of the planted native trees proposed for removal are considered 'Koala Use Species' under the South Coast Koala Management Area, which is discussed further in Section 5.5. Given the relatively small area of planted native vegetation impacted (0.45 ha) and the lack of connectivity to remnant native vegetation, the loss of this foraging habitat will have a negligible impact on threatened fauna. Threatened species occurring within the locality are likely to forage within vegetated riparian corridors with connectivity to large intact remnants. However, given the proximity of the subject site to GHFF sightings and camps, a 5-part Test of Significance (BC Act) and Assessment of Significance (EPBC Act) was undertaken. This is further discussed in Section 5.3.3.3 and 5.4.3 and can be found in Appendix B and C.

No threatened flora species were observed, and none are considered likely to occur based on the highly disturbed condition of the vegetation.

Figure 15: Vegetation proposed for removal within the subject site

5.2. Indirect Impacts

Indirect impacts are those impacts that do not directly affect habitat and individuals but have the potential to interfere through indirect action. Indirect impacts considered for this assessment are construction site impacts (noise, light and weed invasion) and downstream impacts (sedimentation, dust, accidental spills and leaks).

During the construction, noise, dust and to a small degree vibration will be emitted which could have an indirect impact on local fauna. These impacts result from the operation of heavy machinery to clear vegetation and construct the buildings and infrastructure. These impacts are short term only and therefore are unlikely to significantly impact fauna. Also, during the construction period there is a risk that sediment runoff may impact adjacent native vegetation and nearby tributaries if appropriate sediment and erosion measures are not in place. These impacts will be managed via an appropriate sediment and erosion control plan. The overall impacts are likely to be minor.

The proposed development will include flood lighting around the western sports field (Community Field 2, Figure 3) to facilitate sporting activities during evenings throughout much of the year. Artificial lighting is known to have a significant impact on nocturnal species, reducing their ability to forage, avoid predators and find suitable shelter in areas where lighting exists. As such, the deployment of artificial lights has been found to decrease overall richness and activity levels, particularly for small-bodied, flying species such as microbats (Scanlon and Petit 2008). Nocturnal foraging species, including microbats, are known to occur in the local areas (with two threatened microbats recorded within close proximity to the site – Little and Large Bent-winged Bats). The inclusion of flood lighting for the planned sports field will likely reduce foraging habitat in the local area, particularly for slow-flying, clutter space and edge space adapted species which likely are foraging in the open, cleared areas and along the edge of the canopy vegetation (i.e., Chocolate Wattled Bat, Little Bent-winged Bat, Gould's and Lesser Long-eared Bats and Little Forest Bats). These species have been shown to be negatively affected by artificially lit sources set at forest edges in the Sydney region (Haddock *et al*. 2019). However, not all light sources and lighting designs have the same negative effect on nocturnal foragers, and bat activity differs with the spectrum of light emitted by lights (reviewed by Stone *et al*. 2015), illumination levels and the level of light spillage (determined by height and light design). As such, the impacts of lighting can be minimised by selecting the appropriate lighting design for the bat species in an area. Appropriate lighting sources and design recommendations are provided in Section 6: Mitigation Measures.

Possible increase in weed infestation can result if weed propagules are introduced or moved around by machinery during construction. Weed control measures are recommended below to minimise this risk.

Due to the floodplain nature of the subject site, the use of herbicides/pesticides for the ongoing maintenance of the sports fields and surrounds could impact the native vegetation, including the area of *PCT 4049 – South Coast Floodplain Grassy Swamp Forest* which is considered to be *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* - a EEC under the BC Act (it does not meet the requirements for EPBC Act, as discussed in section 4.2.2). Chemical use should be kept to a minimum, if used at all, and never within a week of predicted rainfall to not degrade this PCT further.

As such, indirect impacts to threatened species, populations and ecological communities are unlikely to be significant and will be managed.

5.3. Biodiversity Conservation Act 2016

The BC Act requires that a Biodiversity Development Assessment Report (BDAR) be submitted with a DA when the Biodiversity Offset Scheme (BOS) is triggered. The thresholds for the BOS will not be triggered by the proposed development, therefore a BDAR will not be required to be submitted with the DA. The potential triggers for a BDAR are detailed in the following sections.

5.3.1. Area clearing threshold

For the subject site, there is no minimum lot size listed for Lot 1 and 2 DP 1172135, therefore the minimum lot size is the size of the lots, 3.05 ha and 11.89 ha respectively. The threshold for clearing native vegetation, above which the BOS applies, for a property with a minimum lot size between 1 and 40 ha is the clearing of 0.5 ha or more. Therefore, this is the area clearing threshold of the lots.

The proposed development will remove approximately 0.45 ha of planted native vegetation, therefore, it does not trigger the area clearing threshold for the BOS.

5.3.2. Biodiversity Values Map and Areas of Outstanding Biodiversity Value

Vegetation within the subject site is not currently mapped on the Biodiversity Values Map (accessed July 2023). The subject site is not identified as an Area of Outstanding Biodiversity Value.

5.3.3. Test of significance

If a species, population or ecological community listed under Schedules 1 or 2 of the BC Act is likely to be impacted, Section 7.3 of the BC Act must be used to determine if there is likely to be a significant impact on that species, population, ecological community or habitat. A Test of Significance, comprising a 5-part test, must be applied to each species, population or ecological community that is likely to be impacted. This enables a decision to be made as to whether there is likely to be a significant impact on the species and if a Biodiversity Development Assessment Report (BDAR) is required.

5.3.3.1. Threatened ecological communities

One TEC was found present within the subject site: *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, which is listed as Endangered under the BC Act. However, no removal of this TEC will occur and therefore no Tests of Significance for any TECs were required to be undertaken for this proposal.

5.3.3.2. Threatened flora

No threatened flora was identified in the subject site during field surveys. The subject site was considered unlikely to provide habitat for any threatened flora species. Therefore, Tests of Significance for threatened flora were not undertaken.

5.3.3.3. Threatened fauna

No threatened fauna was identified in the subject site during field surveys.

The trees planned for removal could provide potential foraging habitat for the GHFF, which is listed as Vulnerable under the BC Act. There is one GHFF active camp within 5km of the subject site. As per the BC Act guidelines, a five-part Test of Significance was undertaken to determine impact on the species (Appendix B). Following application of the Test of Significance, it was determined that a significant impact to the GHFF was unlikely to result from the proposed development.

The subject site contains marginal foraging habitat for four microbat species listed as Vulnerable under the BC Act (*Falsistrellus tasmaniensis* (Eastern False Pipistrelle), *Miniopterus australis* (Little Bent winged bat), *Miniopterus orianae oceanensis* (Large Bent-winged bat), and *Scoteanax rueppellii* (Greater Broad-nosed Bat)). Whilst this habitat is marginal in quality and small in size in the local context and the size of these species foraging range, a five-part Test of Significance was undertaken to determine impact on the species, with particular focus on the impact of flood lighting planned as a component of the proposed development (Appendix B). Following application of the Test of Significance, it was determined that a significant impact to the four microbat species was unlikely to result from the proposed development.

5.4. EPBC Act Impact Assessment

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where MNES may be affected. Under the Act, any action which "has, will have, or is likely to have a significant impact on a MNES" is defined as a controlled action and requires approval from the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The process includes the application of Significant Impact Criteria for listed MNES that will be affected as a result of the proposed action. Impact assessment guidelines outline a number of criteria to provide assistance in conducting the assessment and help decide whether a referral to the Commonwealth is recommended. These guidelines were used in applying the Significant Impact Criteria as outlined below.

5.4.1. Threatened ecological communities

No EPBC Act listed TECs were identified within the subject site. Therefore, Significant Impact Criteria were not applied for TECs.

5.4.2. Threatened flora

No EPBC Act listed threatened flora were identified in the subject site during field surveys. The subject site was considered unlikely to provide habitat for any threatened flora species. Therefore, Significant Impact Criteria were not applied for threatened flora.

5.4.3. Threatened fauna

No EPBC Act listed threatened fauna were identified in the subject site during field surveys. The subject site is considered to provide potential marginal foraging habitat for the GHFF which is listed as Vulnerable under the EPBC Act. Therefore, the Significant Impact Criteria according to the EPBC guidelines was applied (Appendix C). It was determined that the proposed development would not have a significant impact on this species.

5.5. SEPP (Biodiversity and Conservation) 2021 – Chapter 4: Koala Habitat Protection (KHP) 2021

The development control provisions of the SEPP Chapter 4 KHP 2021 (DPE 2023e): apply to development applications relating to land within a council listed in Schedule 2 and:

1. *Where there is an approved Koala Plan of Management for the land*
    a. *The development application must be consistent with the approved Koala Plan of Management that applies to the land.*
2. *Where there is no approved Koala Plan of Management for the land, if the land*

a. *Has an area of more than 1 hectare, or*
b. *Has, together with any adjoining land in the same ownership, an area of more than 1 hectare, whether or not the development application applies to the whole or only the part of the land.*

Wollongong LGA is listed in Schedule 2 of the SEPP, where all land use zones are subject to the provisions of the SEPP Chapter 4 KHP 2021. Wollongong City Council does not have an existing approved Koala Plan of Management, and the subject site is part of a Lot which is greater than 1 ha in size. Therefore, the SEPP KHP applies to the proposed development.

Clause 4.9 (5) of the SEPP Chapter 4 KHP 2021 states that consent may be granted to the Development Application if the subject site:

- *Does not include any trees belonging to the koala use tree species listed in Schedule 3 for the relevant koala management area, OR*
- *Is not core koala habitat.*

With reference to the SEPP KHP mapping viewer (DPE 2023f), the subject site is located within the South Coast Koala Management Area (KMA). The planted native vegetation, within the subject site, contains the following tree species which are listed as koala use tree species under Schedule 3 of SEPP Chapter 4 KHP 2021 for the South Coast KMA:

- *Corymbia maculata* (Spotted Gum)
- *Eucalyptus botryoides* (Bangalay)
- *Eucalyptus eugenioides* (Thin-leaved Stringybark)
- *Eucalyptus longifolia* (Woollybutt)
- *Eucalyptus pilularis* (Blackbutt)
- *Eucalyptus saligna* (Sydney Blue Gum)
- *Eucalyptus sieberi* (Silvertop Ash)
- *Eucalyptus tereticornis.* (Forest Red Gum).

Of this list, the trees proposed for removal include: *Corymbia maculata, Eucalyptus botryoides, E. eugenioides, E. pilularis* and *E. tereticornis*. However, Clause 4.9 (3) states that *if the council is satisfied that the development is likely to have low or no impact on koalas or koala habitat, the council may grant consent to the development application.*

Taking into consideration the highly fragmented nature of the subject site, limited connectivity to intact vegetation, barriers to movement including housing and roads and marginal habitat present within the subject site, the removal of these 'koala use tree species' is likely to have low or no impact on Koalas or Koala habitat.

Additionally, vegetation being directly impacted by the proposed development would not be considered *core koala habitat*. The absence of *highly suitable koala habitat* (which is defined as areas where 15% or more of the total trees of the PCT are the regionally relevant species of those listed in Schedule 3 of the SEPP KHP 2021) in the subject site, combined with no previous koala sightings recorded in the subject site within the previous 18 years, indicates that the subject site does not contain *core koala* habitat as defined by Clause 4.2 (1) (DPE 2023e).

5.6. Resilience and Hazards SEPP (2021), Chapter 2: Coastal Management

The subject site occurs on three types of coastal management areas listed under Divisions 1, 3 and 4 of the Resilience and Hazards SEPP (2021), Chapter 2: Coastal Management (DPE 2023g):

- Proximity to coastal wetlands or littoral rainforest (Table 3)
- Coastal environment area (Table 4)
- Coastal use area (Table 5).

Future investigation is required during design development to address how the works could meet the objectives of each coastal management area. Preliminary guidance is discussed below in Table 3 – Table 5 for a selection of environmental considerations. Please refer the published Coastal SEPP for full text: State Environmental Planning Policy (Resilience and Hazards) 2021 - NSW Legislation.

Table 3: Division 1 – Development on land in proximity to coastal wetlands or littoral rainforest

Consideration	Action
(1) Development consent must not be granted to development on land identified as "proximity area for coastal wetlands" or "proximity area for littoral rainforest" on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on—	
(a) the biophysical, hydrological or ecological integrity of the adjacent wetland or littoral coastal rainforest, or	The area mapped as Coastal Wetland Proximity area (Figure 10) is a portion of the eastern side of the subject site. The majority of the area mapped as Coastal Wetland Proximity area is assumed to remain an open sports field. For the purpose of the SEPP the following considerations can be addressed: • Biophysical and ecological integrity – the definitions of these attributes overlap. 'Ecology' or 'biophysics' is understanding how the biotic component (flora and fauna) interact with the abiotic component (water, fire, soil, nutrients, sunlight etc). The integrity of the biota can be protected by avoiding direct impacts (clearing) and ensuring indirect impacts are managed (e.g. weeds, erosion, and water quality), ensuring the area can provide functions and processes to support its ecosystem. • Hydrological – the development would not impede the hydrology within the wetland or obstruct connectivity with the ocean. Flows leaving the site and entering the wetland would likely be similar before and after development. The design should consider how surface flows currently flow across the open space into the wetland and aim to avoid disturbing those flows.
(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.	The quality of water running off the development into the wetlands will be addressed through a Neutral or Beneficial Effect (NorBE) assessment, or similar, where suspended solids, nitrogen and phosphorus loads are to be less than or equal to the current situation. Discharge can be controlled through basin design. Gross pollutants can be trapped before entering waterways. No groundwater impacts are foreseen. Suitable vegetation should be assigned for the suburb's public spaces:

Consideration	Action
	• Avoid planting deciduous trees within 40 m of waterways, or in areas where excessive leaf drop cannot be contained from stormwater runoff. Seasonal leaf drop can have detrimental effects on the aquatic ecology, such as decreased dissolved oxygen due to leaf decomposition, and irregular food sources for detritivores that support the food web. • Avoid planting species that may become weeds in the adjacent riparian corridor.

Table 4: Division 3 – Development on land within the coastal environment area

Consideration	Action
(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—	
(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,	Similar to Table 3 but applicable to the non-wetland area.
(b) coastal environmental values and natural coastal processes,	Existing values and processes would not be affected.
(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,	There are no areas within the subject site listed as a sensitive coastal lakes identified as per Schedule 1.
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	Marine vegetation would not be harmed. Native vegetation will be impacted and has been discussed in Section 5.1.1. No headlands or rock platforms would be developed under this proposal.
(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	Open space would be maintained or improved elsewhere on the subject site if impacted. Public access to the foreshore is not applicable to the subject site.
(f) Aboriginal cultural heritage, practices and places,	Requires site analysis.
(g) the use of the surf zone.	The development is not in the surf zone.

Table 5: Division 4 – Development on land within the coastal use area

Consideration	Action
(1) Development consent must not be granted to development on land that is within the coastal use area unless the consent	

Consideration	Action
authority—(a) has considered whether the proposed development is likely to cause an adverse impact on the following—	
(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	Access to foreshore, beach, headland or rock platform is not applicable to the subject site.
(ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,	Requires site analysis.
(iii) the visual amenity and scenic qualities of the coast, including coastal headlands,	Requires visual impact assessment.
(iv) Aboriginal cultural heritage, practices and places,	Requires site analysis.
(v) cultural and built environment heritage.	Requires site analysis.

5.7. Wollongong City Council Development Control Plan (DCP)

The Wollongong DCP sets out the proposed development objectives and design principles for the Wollongong LGA including the subject site.

The chapters listed in Table 6 relate to impact to biodiversity within the subject site and therefore have been addressed in this report. Table 6 addresses each of these components or refers to sections of this report that are relevant.

Table 6: Wollongong DCP (WCC 2019a) in regard to biodiversity of the subject site

DCP Chapter	Aims and objectives	Addressed by
Chapter D14 Wollongong Innovation Campus	• To preserve any areas of 'Swamp Oak Forest'	Section 5.3.3.1 and 5.4.1
	• To maintain the appropriate native vegetative species derived from the plant species list established from Puckey's Estate	For client to include in future landscaping design
Chapter E17 Preservation and Management of Trees and Vegetation	• Removal of significant native vegetation only be carried out with Council approval	Plans of vegetation removal to be submitted with DA by client
	• Protection and enhancement of native vegetation, habitat for native fauna and biodiversity	Section 5.1
	• Conservation of trees of ecological, heritage, aesthetic and cultural significance	Section 5.1
	• Conservation of significant stands of remnant vegetation	Section 5.3.3.1 and 5.4.1
	• Ensures that any new development considers and maximises the protection of existing vegetation in the site planning, design, development, construction and operation of the development.	Section 6
Chapter E18 Threatened Species Impact Assessment	• A Flora and Fauna Assessment to be lodged with a development application where there is potential impact of any threatened species	Hence this FFA report

6. Mitigation measures

The following measures described in Table 7 are recommended to lessen the potential impacts of the proposed development, including habitat for threatened species and ecological processes. The ameliorative measures have been designed in consideration of relevant legislation and guidelines.

Table 7: Recommendations

Species / sensitive area	Potential impact	Appropriate mitigation measure
Native vegetation: PCT 4049 / TEC 10945 – Swamp Oak Floodplain AND Planted native	Compaction of soil. Accidental damage/clearing. Further degradation due to contamination, run-off and other direct impacts.	Pre-construction: • Install temporary barrier fencing to prevent entry into adjacent vegetation and appropriate 'no-go zone' signage. • Installation of tree protection measures as per the Arboriculture Impact Assessment (Tree Survey 2021). During construction: • Maintain temporary fencing to prevent access into retained vegetation. Post construction: • Stabilise all disturbed areas, implement vegetation protection measures as required. • Consider use of locally occurring native vegetation within the landscape plan. • Restrict the use of chemicals such as herbicides and pesticides for maintenance of the proposed sporting fields. • Restrict the access of public and patrons within sensitive areas (in particular the area mapped as PCT 4049) when flooding occurs to minimise further degradation and disturbance when substrate is unstable.
Fauna habitat	Planted native vegetation planned for removal is considered potential Grey-Headed Flying-fox foraging habitat. Any other fauna species inhabiting vegetation planned for removal.	Vegetation habitat removal including that of the Grey-Headed Flying-fox: • Pre-clearance survey of trees prior to removal to ensure no new fauna nesting habitat has been established (recently formed hollows). • If fauna identified in the pre-clearance survey, trees should be removed under supervision by an ecologist to ensure animal welfare and capture / relocation if required. If none detected, then not required. • Removal of trees should proceed slowly and carefully to allow any resident fauna disturbed by the works to escape. • The construction management plan should include instructions for dealing with orphaned or injured native animals and include the contact details for the NSW Wildlife Information, Rescue and Education Service Inc. (WIRES).
Sediments and erosion control	Increase in sediment flow into stormwater	Pre-construction: • A Sediment and Erosion Control Plan is required prior to any on-ground works.

Species / sensitive area	Potential impact	Appropriate mitigation measure
		• Soil and erosion control measures such as sediment fencing must be installed prior to on-ground works. These are to be inspected regularly and more frequently during rain periods to ensure structures are in proper working order. <u>During Construction:</u> • Surface runoff should be diverted away from areas of soil disturbance and the waterways. • Measures to prevent tracking of soils / sediments from work site to roadways, footpaths and drainage lines as a result of work vehicle / machinery movement. • Vehicle and machinery movement will be confined to designated tracks and work areas. <u>Post-construction:</u> • Bare areas should be mulched, using on-site native vegetation if removed, following clearance works to prevent erosion or soil damage. Alternatively, erosion prone areas, when not in use, may be covered with biodegradable weed matting or similar product.
Spread of weeds and disease	Introduction of new weeds species	<u>Pre-construction</u>: • All equipment must be thoroughly cleaned of soil and weed propagules prior to entry into the subject site. <u>During construction:</u> • All equipment must be cleaned before exiting the subject site. • All weed propagules are to be bagged and removed offsite, preferably the same day and disposed of at designated green waste facility.
Artificial light pollution	Decreased quality and availability of foraging for nocturnal species, particularly microbats, Increased likelihood of predation of nocturnal species, particularly microbats Reduced suitability of roost signs in the surrounding area	<u>During construction</u> • Ensure no lighting is used at night, with construction confined to daytime works. <u>Post-construction</u> • Install lighting that minimised the negative impacts on nocturnal foragers, including microbats. • Bat activity differs with the spectrum of light emitted by streetlights (reviewed by Stone *et al*. 2015), and as such Australian Dark Sky Alliance (ADSA) approved LED lighting (i.e. fittings to be a maximum of 3000K (warm white) is usually recommended for minimising impacts on most bat species. As ASDA approved LED lighting is not fit for purpose for sports grounds (typically 5700K(Daylight)), impacts will be minimised through application of spill lighting requirements in accordance with AS4282. This will limit impacts to the sprots field and ensure minimal spillage to the adjacent vegetation, which can continue to provide habitat for microbat movement and foraging.

7. References

Churchill, S., 2008. *Australian Bats* 2nd Ed. Allen & Unwin, Crows Nest, NSW

Department of Climate Change, Energy, The Environment and Water (DCCEEW), 2021. *National Recovery Plan for the Grey-headed Flying-fox*. Accessed via https://www.dcceew.gov.au/sites/default/files/documents/recovery-plan-grey-headed-flying-fox.pdf

Department of Climate Change, Energy, The Environment and Water (DCCEEW), 2023a. *National Flying-fox monitoring viewer*. Available: National Flying-fox monitoring viewer (environment.gov.au)

Department of Climate Change, Energy, The Environment and Water (DCCEEW), 2023b. *Protected Matters Search Tool* (PMST). Available at Protected Matters Search Tool: Interactive Map (awe.gov.au)

Department of Environment and Energy (DoEE), 1999. *Conservation advice (incorporating listing advice) for the Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*. Accessed via https://www.environment.gov.au/biodiversity/threatened/communities/pubs/141-conservation-advice.pdf

Department of Planning and Environment NSW (DPE), 2022. *BioNet Vegetation Classification*. Available at https://www.environment.nsw.gov.au/research/Visclassification.htm

Department of Planning and Environment NSW (DPE), 2023a. *Biodiversity Values Map and Threshold Tool*. Accessed via Biodiversity Values Map and Threshold tool (nsw.gov.au)

Department of Planning and Environment NSW (DPE), 2023b *BioNet Atlas of NSW Wildlife*. Accessed via http://www.bionet.nsw.gov.au/

Department of Planning and Environment NSW (DPE), 2023c. *Coastal Management spatial viewer*. Accessed via NSW Coastal Management State Environmental Planning Policy Maps

Department of Planning and Environment NSW (DPE), 2023d. *ePlanning Spatial Viewer*. Accessed via NSW Planning Portal Spatial Viewer

Department of Planning and Environment NSW (DPE), 2023e. *State Environmental Planning Policy (Biodiversity and Conservation) 2021*. Accessed via State Environmental Planning Policy (Biodiversity and Conservation) 2021 - NSW Legislation

Department of Planning and Environment NSW (DPE), 2023f. *State Environmental Planning Policy - Koala Habitat Protection Spatial viewer*. Accessed via State Environmental Planning Policy - Koala Habitat Protection (nsw.gov.au)

Department of Planning and Environment NSW (DPE), 2023g. *State Environmental Planning Policy (Resilience and Hazards) 2021.* Accessed via https://legislation.nsw.gov.au/view/html/inforce/current/epi-2021-0730#statusinformation

Department of Planning and Environment NSW (DPE), 2023h. *Threatened Species Profiles*. Accessed via http://www.environment.nsw.gov.au/threatenedspecies

Department of Planning and Environment NSW (DPE), 2023i. *Threatened Species Profile Grey-headed Flying-fox*. Accessed via http://www.threatenedspecies.environment.nsw.gov.au/index.aspx

Department of Primary Industries (DPI), 2023*. Fisheries NSW Spatial Data Portal* – Key Fish Habitat layer: https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fisheries_Data_Portal. Accessed July 2023

Haddock, J.K., Threlfall, C.G., Law, B. and Hochuli, D.F., 2019. Light pollution at the urban forest edge negatively impacts insectivorous bats. *Biological Conservation*, 236, pp.17-28.

Scanlon, A.T. and Petit, S., 2008. Biomass and biodiversity of nocturnal aerial insects in an Adelaide City park and implications for bats (Microchiroptera). *Urban Ecosystems*, *11*(1), pp.91-106.

Stone. E. L., Harris. S. and Jones. G., 2015. Impacts of artificial lighting on bats: a review of challenges and solutions. *Mammalian Biology* 80:213-219.

Tree Survey Pty Ltd, 2023. *Arboriculture Impact Assessment and Tree Protection Plan St George Illawarra Dragons (SGID) Community & High-Performance Centre (CHPC) Version 4.* Prepared for St George Illawarra Rugby League Football Club Pty Ltd.

Wollongong City Council (WCC), 2009a. *Wollongong Development Control Plan (DCP)*. Accessed via https://www.wollongong.nsw.gov.au/__data/assets/pdf_file/0027/8964/Wollongong-DCP-2009-Chapter-D14-Wollongong-Innovation-Campus.pdf

Wollongong City Council (WCC), 2009b. *Wollongong Local Environmental Plan 2009 (2010 EPI 76).* Accessed via https://legislation.nsw.gov.au/view/html/inforce/current/epi-2010-0076#sec.7.15

Appendix A Likelihood of Occurrence

An assessment of likelihood of occurrence was made for threatened species, populations, ecological communities and migratory species identified from the database searches. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some Migratory or Marine species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- 'known' = 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 within the subject site and in the vicinity is unsuitable for the species.

A test of significance was conducted for threatened species that were recorded within the subject site or had a higher likelihood of occurring and were not recorded during the site visit. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the subject site intermittently for foraging. For these fauna species, the habitat present and likely to be affected is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, a test of significance in reference to State or Commonwealth legislation was not considered necessary.

Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database and the NSW Threatened Species Profile Database.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
ECOLOGICAL COMMUNITIES					
10945 - Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions		E	-	Coastal floodplains of NSW. Known from parts of the Local Government Areas of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes, Port Stephens, Maitland, Newcastle, Cessnock, Lake Macquarie, Wyong, Gosford, Pittwater, Warringah, Hawkesbury, Baulkham Hills, Hornsby, Lane Cove, Blacktown, Auburn, Parramatta, Canada Bay, Rockdale, Kogarah, Sutherland, Penrith, Fairfield, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Wollongong, Shellharbour, Kiama, Shoalhaven, Eurobodalla and Bega Valley. 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 elevation.	Likely – is associated in part with PCT 4049 which was identified within the subject site
20391 - Illawarra and south coast lowland forest and woodland ecological community		-	CE	The ecological community was placed on the 2014 Finalised Priority Assessment List as the 'Illawarra Lowlands Grassy Woodland' (hereafter referred to as 'Illawarra and south coast lowland forest and woodland', or 'the ecological community'). It comprises eucalypt forest or woodlands, which can have a grassy ground layer and/or a shrub layer as well as a small tree layer. The distribution is patchy, with the remaining occurrences mostly on lowland sandy loam, loam or clay loam soils around Wollongong to Shellharbour, Milton, Bawley Point and Moruya. The ecological community encompasses the NSW listed endangered ecological community 'Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion' (NSW Scientific Committee, 1999). The Illawarra and south coast lowland forest and woodland typically occurs within 30 km of the coast in coastal valleys and low-lying foothills on the south coast of NSW. In the northern part of the ecological community's range, a sharp boundary is provided by the steep slopes of the eastern coastal escarpment. The ecological community can occur below approximately 350 m above sea level (ASL), but most occurrences are at a much lower altitude; between 10 and 150 m ASL(Tozer *et al*, 2010)..	No – Not present in subject site
20401 - Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community		-	E	The ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, north of Gladstone, in Queensland to Bermagui in southern New South Wales. The ecological community is found within the South Eastern Queensland (SEQ), NSW North Coast (NNC), Sydney Basin (SYB) and South East Corner (SEC) IBRA7 bioregions (Department of the Environment and Energy, 2012) (see Appendix A). The extent of the ecological community corresponds to country (the traditional lands) of a number of	No – Not present in subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
				Indigenous groups, including the Gureng Gureng, Bajtala, Gubbi Gubbi, Yuggera, Bundjalung, Gumbaynggirr, Dainggatti, Biripi, Worimi, Awabakal, Kurin-gai, Eora, Dharug, Tharawa/D'harawal and the Yuin. The ecological community occurs in coastal catchments, mostly at elevations of less than 20 m above sea-level (ASL) that are typically found within 30 km of the coast. However, this distance varies by catchment; for example, low elevations can occur as far as 40 km inland on the Hawkesbury River, or more than 100 km on the Clarence River. On the mid and north coast of NSW the ecological community may also occur up to 50 m ASL on floodplains of, or coastland flats associated with, former or current coastal river systems (Department of Environment and Climate Change, 2007).	
20396 - Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion		-	CE	The Illawarra–Shoalhaven subtropical rainforest ecological community occurs south of Sydney in NSW, in the Sydney Basin IBRA3 Bioregion. It occurs in the Illawarra, Jervis and Sydney Cataract IBRA subregions, and just over the borders into Burragorang, Moss Vale and Ettrema (subregions; it may also occur elsewhere in the Sydney Basin Bioregion, in other subregions. The majority of the ecological community occurs in the Illawarra IBRA Subregion. It occurs on the coastal plain, low-lying foothills and slopes, benches and drainage lines of the eastern coastal escarpment (and of some coastal mountains), between the Hacking and Clyde rivers. It rarely extends onto the upper escarpment slopes. It is usually found below 350 m above sea level (ASL); but there are occurrences up to around 550 – 600 m ASL. Much of the ecological community occurs between Stanwell Park and Gerringong (where it was termed the Illawarra Brush by Mills & Jakeman (1995)). It continues south to the Shoalhaven River; and westwards into Kangaroo Valley and around gorges of the Ettrema region and Toorooroo Plateau (Mills 2010) (Tozer *et al*. 2010).	No – Not present in subject site
20383 - River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria		-	CE	The River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria is found in the South East Corner (SEC) and Sydney Basin (SYB) IBRA bioregions. The extent of the ecological community corresponds to country (the traditional lands) of several Indigenous groups. These include the Worimi, Wonnarua, Awabakal, Darkinung, Kurin-gai, Eora, Dharug, Tharawal/D'harawal, Yuin, Bidwell and the Kurnai. The ecological community occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans. Floodplains may be occasionally or more often saturated, water-logged or inundated. The ecological community is typically found below 50 metres above sea-level (m ASL), although	No – Not present in subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
				it can occur up to 250 m ASL (e.g. on floodplain pockets and plateaus above nick points). The structure of the ecological community is generally a tall open forest to woodland, but there may be localised areas of closed forest and/or low forest, often associated with disturbance (including flooding). The structure tends to be lower and less dense in the wider floodplains, whereas taller denser forests occur in the more confined floodplains.	
FAUNA					
Anthochaera phrygia	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 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 *Casuarina cunninghamiana* (River Oak).	Unlikely - is known to occur within a 5km radius, however no suitable habitat exists within subject site
Arctocephalus pusillus doriferus	Australian Fur-seal	V		Reported to have bred at Seal Rocks, near Port Stephens and Montague Island in southern NSW. Haul outs are observed at isolated places along the NSW coast. Rocky parts of islands with flat, open terrain.	No - habitat not identified within subject site
Ardenna carneipes	Flesh-footed Shearwater	V	M	Recorded in NSW coastal waters. Breeds on Lord Howe Island. Marine.	Unlikely - habitat not identified within subject site, however, there have been sightings recorded nearby. It is unlikely that this species would use the habitat within the subject site.
Botaurus poiciloptilus	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	No - habitat not identified within subject site
Calidris alba	Sanderling	V	M	Occur along the NSW coast, with occasional inland sightings. Arrives from September and leaves by May (some may overwinter in Australia). Coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and lagoons; rarely recorded in near-coastal wetlands.	No - habitat not identified within subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Calidris canutus	Red Knot		E, M	Summer migrant to Australia. In NSW, widespread in suitable habitat along the coast. Occasionally recorded inland in all regions. Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	No - habitat not identified within subject site
Calidris ferruginea	Curlew Sandpiper	E1	CE, M	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	No - habitat not identified within subject site
Calidris tenuirostris	Great Knot	V	CE, M	In NSW, recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	No - habitat not identified within subject site
Callocephalon fimbriatum	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.	Unlikely – records of this species occur within a 5km radius, however habitat is very marginal within subject site.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo		V	Inland to the southern tablelands and central western plains of NSW. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Dependent on large hollow-bearing eucalypts for nest sites.	No - habitat not identified within subject site.
Cercartetus nanus	Eastern Pygmy-possum	V		In NSW, it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Rainforest, sclerophyll forest (including Box-Ironbark), woodland and heath.	No - habitat not identified within subject site.
Chalinolobus dwyeri	Large-eared Pied Bat	V	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.	No - habitat not identified within subject site.
Charadrius leschenaultii	Greater Sand-plover	V	V, M	In NSW, recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in	No - habitat not identified within subject site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
				NSW, mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	
Circus assimilis	Spotted Harrier	V		Found throughout the Australian mainland, except in densely forested or wooded habitats, and rarely in Tasmania. Grassy open woodland, inland riparian woodland, grassland, shrub steppe, agricultural land and edges of inland wetlands.	No - habitat not identified within subject site.
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	V	Eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys.	No - habitat not identified within subject site.
Coracina lineata	Barred Cuckoo-shrike	V		Rare in NSW but recorded along coast south to the Manning River. Rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses.	No - habitat not identified within subject site.
Dasyornis brachypterus	Eastern Bristlebird	E1	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	No - habitat not identified within subject site.
Dasyurus maculatus	Spotted-tailed Quoll	V	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.	Unlikely – a single nearby sighting of a dead individual was recorded in 2019, however, no suitable habitat exists within subject site.
Diomedea antipodensis	Antipodean Albatross	V	V	Regularly occurs off the NSW south coast from Green Cape to Newcastle during winter. Marine.	No - habitat not identified within subject site.
Diomedea antipodensis gibsoni	Antipodean Albatross	V	V	Regularly occurs off the NSW south coast from Green Cape to Newcastle during winter. Marine.	No - habitat not identified within subject site.
Diomedea exulans	Wandering Albatross	E1	V, M	Has been recorded along the length of the NSW coast. Marine.	No - habitat not identified within subject site.

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Diomedea gibsoni	Gibson's Albatross	V	V	Regularly occurs off the NSW coast usually between Green Cape and Newcastle. Marine.	No - habitat not identified within subject site.
Ephippiorhynchus asiaticus	Black-necked Stork	E1		Coastal and subcoastal northern and eastern Australia, south to central-eastern NSW and with vagrants recorded further south and inland. In NSW, floodplain wetlands of the major coastal rivers are key habitat. Also, minor floodplains, coastal sandplain wetlands and estuaries.	No - habitat not identified within subject site.
Falco hypoleucos	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.	No - subject site too far from known distribution
Falsistrellus tasmaniensis	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.	Potential – marginal foraging habitat exists within subject site
Fregetta grallaria grallaria	White-bellied Storm-Petrel	V	V	Vagrant birds occur in coastal NSW waters, particularly after storm events. Marine.	No - habitat not identified within subject site.
Glossopsitta pusilla	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.	Unlikely - records occur within a 5km radius, however field survey found habitat was very marginal within subject site.
Grantiella picta	Painted Honeyeater	V	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No - habitat not identified within subject site.
Haematopus fuliginosus	Sooty Oystercatcher	V		Distributed along the entire NSW coast. Rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries.	No - habitat not identified within subject site.
Haematopus longirostris	Pied Oystercatcher	E1		Thinly scattered along the entire NSW coast. Intertidal flats of inlets and bays, open beaches and sandbanks.	No - habitat not identified within subject site.
Haliaeetus leucogaster	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	Unlikely - is known to occur within a 5km radius, however, no stick nests were found, and field

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
				habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	survey found habitat was very marginal within subject site
Heleioporus australiacus	Giant Burrowing Frog	V	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.	No - habitat not identified within subject site.
Hieraaetus morphnoides	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 she-oak or Acacia woodlands and riparian woodlands of interior NSW.	No - habitat not identified within subject site.
Hirundapus caudacutus	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.	Unlikely - habitat marginal within subject site
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No - habitat not identified within subject site
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E1	E	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River. Heath or open forest with a heathy understorey on sandy or friable soils.	No - habitat not identified within subject site
Ixobrychus flavicollis	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.	Unlikely - subject site too far from known distribution
Lathamus discolor	Swift Parrot	E1	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.	No - habitat not identified within subject site
Limosa lapponica baueri	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit		V	The subspecies is most frequently recorded along major coastal river estuaries and sheltered embayment's, particularly the Tweed, Richmond, Clarence, Macleay, Hastings, Hunter and Shoalhaven river estuaries, Port Stephens and Botany Bay. It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It often occurs around beds of seagrass, and sometimes in nearby saltmarsh or the outer margins of mangrove areas.	No - habitat not identified within subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Limicola falcinellus	Broad-billed Sandpiper	V	M	Occur occasionally on the southern Australian coast. In NSW, mainly recorded in Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW. Sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs.	No - habitat not identified within subject site
Litoria aurea	Green and Golden Bell Frog	E1	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 Typha spp. (bullrushes) or Eleocharis spp. (spike-rushes). Some populations occur in highly disturbed areas.	No - habitat not identified within subject site
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. The species has not been recorded in southern NSW within the last decade. Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands.	No - habitat not identified within subject site
Litoria watsoni	Southern Heath Frog		E	Found in southeast NSW from near Wollongong in the north to north eastern Victoria in the south. The species occurs in a variety of forest types, as well as woodland, bushland and heathland. It prefers moister sites, especially in or near tall moist forest.	No - habitat not identified within subject site
Lophoictinia isura	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.	No - habitat not identified within subject site
Macronectes giganteus	Southern Giant Petrel	E1	E, M	Common visitor off the coast of NSW. Marine.	No - habitat not identified within subject site
Macronectes halli	Northern Giant-Petrel	V	V, M	Common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Marine.	No - habitat not identified within subject site
Melanodryas cucullata cucullata	South-eastern Hooded Robin, Hooded Robin (south-eastern)	V	E	Found throughout much of inland NSW. Open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	No - habitat not identified within subject site, subject site too far from known distribution

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Miniopterus australis	Little Bent winged 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.	Potential – marginal foraging habitat exists within subject site
Miniopterus orianae oceanensis	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.	Potential – marginal foraging habitat exists within subject site
Mixophyes balbus	Stuttering Frog	E1	V	Along the east coast of Australia from southern Qld to north-eastern Victoria. Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No - habitat not identified within subject site
Neophema chrysogaster	Orange-bellied Parrot	E4A	CE	Breeds in Tasmania and migrates in autumn to spend the winter on the mainland coast of south-eastern SA and southern Victoria. Occasional reports from NSW, most recently Shellharbour and Maroubra in May 2003. Winter habitat is mostly within 3 km of the coast in sheltered bays, lagoons, estuaries, coastal dunes and saltmarshes. Also small islands and peninsulas, saltworks, golf courses, low samphire herbland and taller coastal shrubland.	Unlikely - habitat marginal within subject site
Neophema chrysostoma	Blue-winged Parrot		V	During the non-breeding period, from autumn to early spring, birds are recorded from northern Victoria, eastern South Australia, south-western Queensland and western New South Wales, with some birds reaching south-eastern New South Wales and eastern Victoria, particularly on the southern migration. Blue-winged parrots inhabit a range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. They tend to favour grasslands and grassy woodlands and are often found near wetlands both near the coast and in semi-arid zones.	Unlikely - habitat marginal within subject site
Neophema pulchella	Turquoise Parrot	V		Occurs along the length of NSW from the coastal plains to the western slopes of the Great Dividing Range. Eucalypt and cypress pine open forests and woodlands, ecotones between woodland and grassland, or coastal forest and heath.	Unlikley - is known to occur within a 5km radius, however field survey found habitat was very marginal within subject site
Ninox connivens	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.	Unlikely - subject site too far from known distribution and no HBTs found

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Ninox strenua	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.	No – no habitat/HBTs identified within subject site
Notamacropus parma	Parma Wallaby	V	V	Confined to the coast and ranges of central and northern NSW. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	No - habitat not identified within subject site
Numenius madagascariensis	Eastern Curlew		CE, M	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	No - habitat not identified within subject site
Oxyura australis	Blue-billed Duck	V		Widespread in NSW but is most concentrated in the southern Murray-Darling Basin area. Coastal and inland wetlands and swamps.	No - habitat not identified within subject site
Pachycephala olivacea	Olive Whistler	V		In NSW chiefly occurs around Barrington Tops and the MacPherson Ranges, and from the Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. Mostly inhabits wet forests above about 500m.	No - habitat not identified within subject site
Pachyptila turtur subantarctica	Fairy Prion (southern)		V	Circumpolar distribution, probably frequents subtropical waters during the non-breeding period. It has been recorded breeding on subantarctic and cool temperate islands in the Southern Hemisphere. The burrows of fairy prions (southern) are usually in crevices, in hollows beneath cushions of *Colobanthus muscoides* (a perennial herb that can form dense mats or cushions up to 250 mm thick and sometimes up to several metres across) or in burrows in peaty soil held together by a thick cover of *Cotula plumosa* (a short, feathery perennial herb).	No - habitat not identified within subject site
Pandion cristatus	Eastern Osprey	V		Common around the northern NSW coast, and uncommon to rare from coast further south. Some records from inland areas. Rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	No - habitat not identified within subject site
Petauroides volans	Greater Glider population in the Eurobodalla local	E2	V	This population on the south coast of NSW is bounded by the Moruya 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.	No - subject site too far from known distribution

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
	government area				
Petaurus australis australis	Yellow-bellied Glider (south-eastern)	V	V	Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.	No - habitat not identified within subject site
Petaurus norfolcensis	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.	No - habitat not identified within subject site
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	No - habitat not identified within subject site
Petroica phoenicea	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 sedgelands at high altitudes.	Unlikely - subject site too far from known distribution
Phascolarctos cinereus	Koala	V	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.	Unlikely - is known to occur within a 5km radius, however, habitat is marginal within subject site. See section 5.5 of report
Phoebetria fusca	Sooty Albatross	V	V, M	There are occasional sightings off the NSW coast, north of Grafton. Marine.	No - habitat not identified within subject site
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	E1	V	In NSW it occurs along the Murray River downstream of Tooleybuc, the Wakool River downstream of Kyalite, and the Murrumbidgee River immediately upstream from the junction with the Murray River and adjoining areas of mallee. There are scattered records	No - habitat not identified within subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
				along the Darling River as far north as Menindee. Nests within River Red Gum forests. Foraging habitat is mallee woodlands, riverine forests and woodlands.	
Potorous tridactylus	Long-nosed Potoroo	V	V	In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Coastal heaths and dry and wet sclerophyll forests.	Unlikely - habitat marginal within subject site
Pseudomys novaehollandiae	New Holland Mouse		V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely - habitat marginal within subject site
Pseudophryne australis	Red-crowned Toadlet	V		Confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. Open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.	No - habitat not identified within subject site
Pterodroma leucoptera leucoptera	Gould's Petrel	V	E	Recorded off NSW coast. Breeds on Cabbage Tree Island offshore from Port Stephens, and on nearby Boondelbah island. Marine. Nesting habitat is located within steeply sloping rock scree gullies with a canopy of Cabbage Tree Palms.	No - habitat not identified within subject site
Pterodroma neglecta neglecta	Kermadec Petrel (west Pacific subspecies)	V	V	Vagrant birds occur in coastal NSW waters, particularly after storm events. Breeds on Balls Pyramid (near Lord Howe Island) and Phillip Island (near Norfolk Island). Marine.	No - habitat not identified within subject site
Pteropus poliocephalus	Grey-headed Flying-fox	V	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.	Likely - is known to occur with numerous records within a 5km radius, including two known camps (one active, one inactive), however, habitat is considered marginal forage habitat only within subject site. Appropriate tests of significance were applied per BC Act and EPBC Act (Appendix B and C)

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Ptilinopus magnificus	Wompoo Fruit-Dove	V		In NSW, occurs south along coast and coastal ranges to the Hunter River. Rainforest, low-elevation moist eucalypt forest and brush box forests.	No - habitat not identified within subject site
Ptilinopus regina	Rose-crowned Fruit-Dove	V		In NSW, found on coast and ranges north from Newcastle. Vagrants are occasionally found further south to Victoria. Sub-tropical and dry rainforest, moist eucalypt forest and swamp forest, where fruit is plentiful.	No - habitat not identified within subject site
Ptilinopus superbus	Superb Fruit-Dove	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 where there are fruit-bearing trees.	No - habitat not identified within subject site
Pycnoptilus floccosus	Pilotbird		V	Pilotbirds are endemic to south-east Australia. Upland Pilotbirds occur above 600 m in the Brindabella Ranges in the Australian Capital Territory, and in the Snowy Mountains in New South Wales and north-east Victoria. Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne. Pilotbirds are strictly terrestrial, living on the ground in dense forests with heavy undergrowth.	No - habitat not identified within subject site
Rostratula australis	Australian Painted Snipe	E1	E	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	No - subject site too far from known distribution
Scoteanax rueppellii	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.	Potential – marginal foraging habitat exists within subject site
Stagonopleura guttata	Diamond Firetail	V	V	Widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and Southwestern Slopes and the Northwest Plains and Riverina. Grassy eucalypt woodlands, open forest, mallee, natural temperate grassland, secondary derived grassland, riparian areas and lightly wooded farmland.	No - habitat not identified within subject site
Sternula albifrons	Little Tern	E1	M	In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. Sheltered coastal environments, harbours, inlets and rivers.	No - habitat not identified within subject site
Sternula nereis nereis	Australian Fairy Tern		V	The subspecies has been known from New South Wales (NSW) in the past, but it is unknown if it persists there. Nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayment's of a variety of	No - habitat not identified within subject site and

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
				habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline.	subject site not within known distribution
Thalassarche bulleri platei	Northern Buller's Albatross, Pacific Albatross		V	In NSW waters it is a relatively common visitor between March and October. Occurs in both inshore and offshore waters, including the continental shelf break and pelagic waters.	No - habitat not identified within subject site
Thalassarche cauta	Shy Albatross	V	V	Occurs along the east coast south from Stradbroke Island and across the south coast to Carnarvon in WA. It is commonly recorded off southeast NSW, though rarely north of Sydney. Marine.	No - habitat not identified within subject site
Thalassarche melanophris	Black-browed Albatross	V	V	Regularly recorded off the NSW coast during May-November. Marine.	No - habitat not identified within subject site
Thinornis rubricollis	Hooded Plover	E4A		Occurs in coastal NSW north to Sussex Inlet. Occasional records from the Shoalhaven River, Comerong Beach and Lake Illawarra. Sandy ocean beaches, tidal bays and estuaries, rock platforms, rocky or sand-covered reefs, and small beaches in lines of cliffs. Also use near-coastal saline and freshwater lakes and lagoons.	No - habitat not identified within subject site
Tyto novaehollandiae	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.	No - habitat not identified within subject site
Tyto tenebricosa	Sooty Owl	V		Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.	No - habitat not identified within subject site
FLORA					
Acacia baueri subsp. *aspera*		V		In NSW, restricted to the Sydney region, on the Kings Tableland in the central Blue Mountains and the Woronora Plateau in the Royal National Park, Mt. Keira district and at Wedderburn. May also occur on the escarpment/Woronora Plateau in the Flat Rock Junction and Stanwell Tops area of the Illawarra. Low, damp heathlands, often on exposed rocky outcrops	Unlikely - subject site too far from known distribution
Acacia bynoeana	Bynoe's Wattle	E1	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.	No - habitat not identified within subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Allocasuarina glareicola		E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora.	No - habitat not identified within subject site
Caladenia tessellate	Thick Lip Spider Orchid	E1	V	Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	No - habitat not identified within subject site
Calochilus pulchellus	Pretty Beard Orchid, Pretty Beard-orchid	E	E	Endemic to New South Wales. It is known from the Sydney Basin Bioregion, where a total of less than 30 adult plants have been recorded in three sites over a range of 40 km on the South Coast of NSW, at altitudes from 20-560 m above sea level. All currently known sites are within the Shoalhaven Local Government Area. At Vincentia the species grows in low Scribbly Gum dominated woodland with a low wet heath understorey. The soil is a sandy loam overlying sandstone. In Booderee National Park it grows in a tall heathy association. In Morton National Park on the Little Forest Plateau it occurs in low heath among scattered clumps of emergent eucalypts and Banksia in shallow coarse white sand over sandstone, in a near-escarpment area subject to strong orographic precipitation.	Unlikely - habitat marginal within subject site
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	Unlikely - habitat marginal within subject site
Cynanchum elegans	White-flowered Wax Plant	E1	E	Restricted to eastern NSW, from Brunswick Heads on the north coast to Gerroa in the Illawarra region, and as far west as Merriwa in the upper Hunter River valley. Dry rainforest; littoral rainforest; *Leptospermum laevigatum-Banksia integrifolia* subsp. *integrifolia* (Coastal Tea-tree– Coastal Banksia) coastal scrub; *Eucalyptus tereticornis* (Forest Red Gum) or *Corymbia maculata* (Spotted Gum) open forest and woodland; and *Melaleuca armillaris* (Bracelet Honeymyrtle) scrub.	Unlikely - is known to occur within a 5km radius, however, field survey did not detect any individuals of this species and found habitat was very marginal within subject site
Genoplesium baueri	Bauer's Midge Orchid	E1	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.	No - habitat not identified within subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
Gossia acmenoides	*Gossia acmenoides* population in the Sydney Basin Bioregion south of the Georges River	E2		This disjunct population is located in the Illawarra region in the LGAs of Wollongong, Shellharbour and Kiama. May also occur in the adjoining LGAs of Shoalhaven and Wingecarribee, where there are areas of suitable habitat. Dry and subtropical rainforest.	No - habitat not identified within subject site
Haloragis exalata subsp. *exalata*	Square Raspwort	V	V	Disjunct distribution in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Protected and shaded damp situations in riparian habitats.	No - habitat not identified within subject site
Leucopogon exolasius	Woronora Beard-heath	V	V	Woronora Beard-heath is found along the upper Georges River area and in Heathcote National Park. The plant occurs in woodland on sandstone.	No - habitat not identified within subject site, subject site not within known distribution
Melaleuca biconvexa	Biconvex Paperbark	V	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.	No - subject site too far from known distribution
Persicaria elatior	Tall Knotweed	V	V	In south-eastern NSW recorded from Mt Dromedary, Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). Beside streams and lakes, swamp forest or disturbed areas.	Unlikely - habitat marginal within subject site
Persoonia acerosa	Needle Geebung	V	V	Recorded only on the central coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. Dry sclerophyll forest, scrubby low-woodland and heath on low fertility soils.	Unlikely - habitat marginal within subject site
Persoonia hirsuta	Hairy Geebung	E1	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.	No - habitat not identified within subject site
Persoonia nutans	Nodding Geebung	E1	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh	No - habitat not identified within subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
				Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	
Pimelea spicata	Spiked Rice-flower	E1	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. Eucalyptus moluccana (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	No - habitat not identified within subject site
Prasophyllum affine	Jervis Bay Leek Orchid	E1	E	Known from three areas south-east of Nowra on South Coast: Kinghorne Point, Wowly Gully near the town of Callala Bay, and near the township of Vincentia. Low heathland and sedgeland communities on poorly drained clay soils.	No - subject site too far from known distribution
Pterostylis gibbosa	Illawarra Greenhood	E1	E	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). Open forest or woodland, on flat or gently sloping land with poor drainage.	No - habitat not identified within subject site
Pterostylis saxicola	Sydney Plains Greenhood	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	No - habitat not identified within subject site
Pultenaea aristata	Prickly Bush-pea	V	V	Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong. The species occurs in either dry sclerophyll woodland or wet heath on sandstone.	No - habitat not identified within subject site, subject site not within known distribution
Rhizanthella slateri	*Rhizanthella slateri* (Rupp) M.A. Clem. & Cribb in the Great Lakes local government area	E2,V	E	The population occurs near Bulahdelah (within the Great Lakes LGA). Sclerophyll forest in shallow to deep loams.	No - habitat not identified within subject site
Rhizanthella slateri	Eastern Australian	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.	No - habitat not identified within subject site

Scientific Name	Common Name	BC Act Status	EPBC Act Status	Distribution/Habitat	Likelihood of occurrence
	Underground Orchid				
Rhodamnia rubescens	Brown Malletwood	CE		Widespread in warmer rainforest and on rainforest margins, mainly coastal; north from Batemans Bay	No - habitat not identified within subject site
Rhodomyrtus psidioides	Native Guava	CE		Grows in warmer rainforest and on rainforest margins; coastal districts north from Gosford district	No - habitat not identified within subject site
Senna acclinis	Rainforest Cassia	E1		Coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Qld. Subtropical and dry rainforest.	No - habitat not identified within subject site
Syzygium paniculatum	Magenta Lilly Pilly	E1	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.	No - habitat not identified within subject site
Thelymitra kangaloonica	Kangaloon Sun Orchid	E4A	CE	Only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. Swamps in sedgelands over grey silty grey loam soils.	No - habitat not identified within subject site
Thesium australe	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.	Unlikely - habitat marginal within subject site
Xerochrysum palustre	Swamp Everlasting	P	V	In NSW, found in Kosciuszko National Park and the eastern escarpment south of Badja. In or on the margins of swamps and bogs which are often dominated by heaths.	No - subject site too far from known distribution

BC Act: E1 = Endangered, E2 = Endangered Population, E4 = Extinct, E4A = Critically Endangered, V = Vulnerable

EPBC Act: M = Migratory, CD = Conservation Dependent, CE = Critically Endangered, E = Endangered, V = Vulnerable, X = Extinct

Appendix B Test of Significance (BC Act)

The 'Test of significance' (5-part test) is applied to species, populations and ecological communities listed on Schedules 1 and 2 of the BC Act and Schedules 4, 4A and 5 of the FM Act. The test sets out five factors, which when considered, allow proponents to undertake a qualitative analysis of the likely impacts of an action and to determine whether a significant impact is likely. All factors must be considered, and an overall conclusion made based on all factors in combination. A Species Impact Statement (SIS) is required if, through application of the five-part test, an action is considered likely to have a significant impact on threatened species, populations or ecological communities.

The threatened species that are subject to the assessment of significance is

- ***Pteropus poliocephalus*** (Grey-headed Flying-fox), listed as Vulnerable under the BC Act
- **Microbat species** (inc. Greater Broad-nosed Bat, Little Bent-winged Bat, Large Bent-winged Bat and Eastern False Pipistrelle), all listed as Vulnerable under the BC Act.

Table 8 and Table 9 outline the results of the significance criteria applied to these species.

Table 8: Biodiversity Conservation Act 2016 Test of Significance for Grey-headed Flying-fox

BC Act	Question	Response
Pteropus poliocephalus (Grey-headed Flying-fox)		
Grey-headed Flying-foxes (GHFF) are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. This species inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 2008). In times of natural resource shortages, they may be found in unusual locations (DPE 2023i). Camps are often located in gullies, typically, close to water, in vegetation with a dense canopy (Churchill 2008). There are a number of recognised threats impacting the potentially affected species. These include loss of roosting and foraging sites, electrocution on powerlines, entanglement in netting and on barbed-wire, heat stress, and conflict with humans (DPE 2023i).		
7.3.1 a)	In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The local population is considered as any individuals within a 20 km radius of the subject site. This is because GHFF can forage up to 20 km at night from their camp and, individuals and small groups will disperse amongst camps within their home range (Churchill 2008). The subject site approximately 5 km away from an active GHFF camp. The proposed works involves the removal of planted native vegetation (0.45 ha), which could be potential foraging habitat. However, the majority of the trees within the subject site will be retained. Those that are proposed for removal primarily exist as fragmented, isolated patches in the south of the subject site and are sparse in comparison to the native vegetation intended to be retained – the removal of this vegetation will not cause any further fragmentation of the surrounding vegetation. There is also a significant amount of foraging habitat still available in the within their nightly foraging range. It's therefore likely to be a marginal foraging site for the GHFF and no breeding habitat will be impacted. As such, the proposed development is unlikely to have an adverse effect on the life cycle of the local population of GHFF to such an extent that will place a viable local population at risk of extinction.
7.3.1 b) i	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
7.3.1 b) ii	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	N/A

BC Act	Question	Response
7.3.1 c) i	In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity	The proposed development will modify foraging habitat but not to an extent that would have a significant impact on the local population. This is due to the relatively small scale of planted native vegetation removal (0.45 ha) and the retention of the majority of trees within the site. No roosting habitat will be affected by the proposed development.
7.3.1 c) ii	In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity	The proposed development will not result in fragmentation or isolation of GHFF habitat as the marginal foraging habitat to be removed within the subject site are primarily trees in the south of the field area – this vegetation is already isolated from the main patches of vegetation that surround the boundaries of the site. Due to the highly mobile nature of the GHFF, the removal of the trees would not increase the level of fragmentation between the GHFF camp and their feeding resources.
7.3.1 c) iii	In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	The habitat within the subject site suitable for the GHFF is marginal forging habitat and does not comprise roosting habitat. The vegetation of the subject site planned for removal is already highly modified and fragmented, and due to the highly mobile nature of the GHFF they are unlikely to be dependent on this habitat. The removal of 0.45 planted native vegetation for the proposed development is unlikely to affect the long term survival of the local population of GHFF.
7.3.1 d)	Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	The activity would not directly or indirectly effect any declared area of outstanding biodiversity value (AOBV) identified by the NSW Department of Planning and Environment. The subject site does not occur on or near an AOBV.
7.3.1 e)	Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposed works involve clearing of native vegetation, which is listed as a key threatening process (KTP). However, the scale of works is considered minor because it represents a very small proportion of the potential habitat that exists for this species in this locality. Due to the proximity of the Illawarra Escarpment State Conservation area, Puckeys Estate Reserve and other surrounding patches of vegetation there are many foraging trees that occur nearby that can be easily accessed by this mobile species.
Conclusion	**Is there likely to be a significant impact?**	Due to the relatively small size of area of marginal foraging habitat proposed for removal (0.45 ha), the highly mobile nature of the GHFF and the vegetation removal not increasing fragmentation of the surrounding vegetation, the proposal is unlikely to constitute a significant impact on the Grey-headed Flying-fox.

Table 9: Biodiversity Conservation Act 2016 Test of Significance for threatened microbat species

BC Act	Question	Response
Microbat species (inc. Greater Broad-nosed Bat, Little Bent-winged Bat, Large Bent-winged Bat and Eastern False Pipistrelle)		
Threatened microbat species that are likely to forage on site include the Greater Broad-nosed Bat, Little Bent-winged Bat, Large Bent-winged Bat and Eastern False Pipistrelle. These species forage on insects either in the open and along the forest edge in a wide range of habitats (Churchill 2008) and can be significantly impacted in their ability and likelihood of foraging when artificial light sources are placed near potential foraging areas. As such, artificial lighting is a known threat to many microbat species		
7.3.1 a)	In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The four threatened microbats that are likely to occur on or near the subject site have large home ranges and occur across much of Sydney. Although these species are adaptable to urban environments, at a local scale, the addition of lighting, particular light with high UV or white light, can result in the local area being no longer suitable for the species to forage or roost. This can have long term impacts by decreasing body condition of individuals, making them more likely to be predated upon and have reduced breeding success. Additionally, some lights that attract insects, can increase foraging availability for some microbat species, but foraging under these lights can make microbats exposed to predation. As such, installation of inappropriate lighting at the sports field could result in the disappearance of these species at a small local scale either through reduction of suitable foraging habitat or predation. However, there is many alternative foraging sites in the local areas and individuals are likely to relocate to these areas to forage, given their high mobility. Additionally, if light spillage is minimised through guidelines such as AS4282, the foraging habitat surrounding the sports field may not be reduced.
7.3.1 b) i	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	N/A
7.3.1 b) ii	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	N/A

BC Act	Question	Response
7.3.1 c) i	In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity	The introduction of artificial lighting on site will likely reduce microbat foraging habitat, with microbats likely to be foraging in the open-cleared area and along the perimeter of the site on the forest edge. Large, high-high illumination lights may make the sports field no longer suitable for microbats. However, as these fields are unlikely to be utilised to a great extent during use due to noise and training activity, this does not constitute a modification or removal of habitat. Additionally, if light spillage is minimised through guidelines such as AS4282, the foraging habitat surrounding the sports field may not be modified.
7.3.1 c) ii	In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity	The site is likely to no longer be suitable for microbat foraging if inappropriate lights are used. This could fragment foraging habitat for microbats, if this site is critical as a connecting corridor to more suitable habitat. However, microbats are highly mobile, and many have large home ranges. The threatened microbats in the area are likely to continue to use non-lit areas in the local vicinity to move to suitable foraging habitat. The amount of foraging habitat available on site is small, and is unlikely to cause a significant reduction in the available foraging habitat of the species within their range. However, if light spillage is minimised through guidelines such as AS4282 to limit light impacts to just the sports field being utilised, microbats are unlikely to be prevented from foraging elsewhere on site and, therefore, habitat is unlikely to become fragmented or isolated.
7.3.1 c) iii	In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	As microbats have large home ranges, and can travel substantial distances each night, if used, the site is unlikely to represent critical foraging habitat which will cause the species to become extinct if it is no longer available. Other areas of bushland in the area likely represent similar, if not better foraging habitat. Additionally, if the recommended lighting is used, the development is unlikely to have any effect on the long-term survival of the species, as suitable lighting can ensure no reduction in foraging habitat.
7.3.1 d)	Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	N/A
7.3.1 e)	Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	N/A

BC Act	Question	Response
Conclusion	**Is there likely to be a significant impact?**	The inclusion of lighting for usage of the sports ground after sunset, could substantially reduce the foraging habitat for microbats and make individuals more susceptible to predation. However, this site is small in comparison to their home ranges, and these highly mobile species are likely to use alternative sites in the local areas to forage. Additionally, if the recommended lighting is used, the impacts of lighting on the sports field may be negligible or non-existent. As such, the usage of lighting on the sports field is unlikely to reduce in a significant impact to the survival of the species.

Appendix C Significance Assessment

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

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

Specific 'Significant Impact Criteria' are provided for each MNES except for threatened species and ecological communities in which separate criteria are provided for those listed as critically endangered, endangered and vulnerable under the EPBC Act.

***Pteropus poliocephalus* (Grey-headed Flying-fox)**

Grey-headed Flying-foxes (GHFF) are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. They occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. Site fidelity to camps is high; some camps have been used for over a century. GHFFs can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. GHFF feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. The also forage in cultivated gardens and fruit crops. (DPE 2023i)

Records of the GHFF occur in proximity to the subject site. The closest recorded Grey-headed Flying-fox camp is located approximately 5 km from the subject site, to the south, in Figtree (Camp 342) (Figure 7). This camp, as per the guidelines in the National Recovery Plan for the GHFF, is not considered a Nationally Important camp (has not exceeded population >10,000 individuals for more than one year in the past 10 years, nor has it consistently held >2,500 individuals permanently for the past 10 years) (DCCWW 2021). Another camp (Camp 229) is listed closer (approximately 3km) in Balgownie, however, this camp is currently listed as un-inhabited (DCCEEW 2023a).

ENDANGERED SPECIES – SIGNIFICANT IMPACT CRITERIA

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

1. lead to a long-term decrease in the size of an important population of a species

The GHFF is highly mobile and has a large home range, travelling distances on feeding forays (up to 20km from roosting sites). As the action area is approximately 5 km from an active GHFF camp and the planted native vegetation proposed for removal represents a small area (0.45 ha) of marginal foraging habitat, it is unlikely the proposed action will lead to any long-term decrease in the size the population.

2. reduce the area of occupancy of an important population

It is unlikely that the proposal would have a significant effect on the occupancy the GHFF population due to the removal of foraging habitat being that of 0.45 ha of native vegetation, the mobile nature of the GHFF and the retention of many other foraging trees in the surrounding area.

3. fragment an existing important population into two or more populations

No fragmentation of the population of GHFF will occur as a result of this action. The action area is approximately 5km from an active camp and the species is highly mobile – the vegetation proposed for removal exists as fragmented, isolated patches and would not cause any further fragmentation to surrounding vegetation if removed.

4. adversely affect habitat critical to the survival of a species

Certain winter and spring flowering vegetation communities can be considered habitat critical to the survival of the GHFF. Back yard fruit trees, orchards or non-native trees that may be used for foraging are not considered to be habitat critical to the survival of the GHFF. Habitat critical to the survival of the GHFF may be vegetation communities which:

- contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May)
- contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the Department's interactive flying-fox web viewer, or
- contain native and or exotic species used for roosting at the site of a nationally important GHFF camp as identified on the Department's interactive flying-fox web viewer.

The action area is located within 20km of numerous GHFF camps that area scattered along the south east coast of NSW, from Sydney to Nowra. It is therefore likely that the vegetation of the action area is within the feeding range of a large number of individuals and multiple camps. However, as discussed, the area of suitable foraging habitat planned for removal is small (0.45 ha) and the closest camp is not considered a nationally important camp (DCCEEW 2021).

5. disrupt the breeding cycle of an important population

It is unlikely the proposed action will affect the breeding cycle of this highly mobile specie for the following reasons:

- There is no roosting habitat within the action area

- The nearest active camp is 5km away – noise and dust pollution from construction will not impact the site at this distance.
- The removal of vegetation will not increase fragmentation between the camp and their foraging sources.

6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The habitat within the action area suitable for the GHFF is marginal forging habitat, but no roosting habitat is present in the form an established camp. The foraging habitat of the action area is already highly modified and fragmented, and due to the highly mobile nature of the GHFF, the removal of (0.45 ha) vegetation for the proposed action is unlikely to decrease the availability or quality of habitat significantly and therefore it is unlikely to cause the species to decline

7. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

The major threats to the GHFF are related to vegetation clearance, conflict with humans and electrocution. These threats are not associated with the increased presence of an invasive species. Furthermore, the ground layer of the action area is already dominated by invasive flora species.

8. introduce disease that may cause the species to decline

The GHFF is susceptible to the Lyssavirus. Increases of the Lyssavirus typically occur when a population is undergoing stress. The action area provides marginal foraging habitat (0.45 ha) that would make up a mosaic of resources that would be utilised in the locality. The removal of a small area of foraging habitat is unlikely to cause a level of distress such that the GHFF is likely to decline.

9. interfere substantially with the recovery of the species.

The recovery of the GHFF requires identifying important roost sites, camp sites and the foraging habitat used around such sites. The extent of the potential foraging habitat within the action area and the large foraging range of this species suggests that the action area would provide a very small percentage of foraging habitat of the resources used within the locality. The action area is not a suitable habitat for roosting or breeding. Thus, the proposed action would be unlikely to interfere with the recovery of this species.

Conclusion

The proposed action is unlikely to constitute to a significant impact on Grey-headed Flying-fox. Based on the above assessment, a referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required.

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