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Nepean Gardens Biodiversity Development Assessment Report

Catholic Metropolitan Cemeteries Trust

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Template 2.8.1

Executive Summary

Eco Logical Australia Pty Ltd (ELA) has been engaged by Catholic Metropolitan Cemeteries Trust to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed re-design of the existing golf course and construction of a cemetery within 13 Park Road, Wallacia (the study area). This BDAR is required because the development site is located on the Biodiversity Values Map.

This BDAR would support the application DA 19/0875 to Penrith City Council under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This BDAR has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) established under Section 6.7 of the *Biodiversity Conservation Act 2016* (BC Act).

ELA understands that the development within the study area consists of the redesign of the existing golf course within the western portion of the study area and the construction of the Nepean Memorial Park within the eastern portion.

The proposed development will require the removal of approximately 0.08 ha of Cumberland riverflat forest (PCT 835) and 0.37 ha of Cumberland shale hills woodland (PCT 850). The removal of 0.80 ha of native planted vegetation was assessed using a streamlined assessment for Planted Native Vegetation. The removal of 0.22 ha of exotic and ornamental vegetation does not require assessment.

Impacts to the study area have been previously assessed by Travers Bushfire and Ecology in a 2017 Flora and Fauna report and in a 2019 BDAR.

This BDAR outlines the measures taken to avoid, minimise and mitigate impacts on the vegetation and species habitat present within the development footprint and measures to minimise impacts during construction and operation of the development. Following consideration of the below aspects, the residual unavoidable impacts of the project were calculated consistent with BAM by utilising the Biodiversity Assessment Method Credit Calculator (BAMC).

Vegetation described as PCT 835 and 850 corresponds to endangered ecological communities, listed under both the BC Act and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). PCT 835 corresponds to the NSW BC Act listed Endangered Ecological Community (EEC), *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (see Table 11). This community is also listed as Critically Endangered under the EPBC Act as *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria*. PCT 850 within the study area corresponds with the NSW BC Act listed Critically Endangered Ecological Community, *Cumberland Plain Woodland in the Sydney Basin Bioregion* (CPW) (see Table 11). This community is also listed as Critically Endangered under the EPBC Act as *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*.

Targeted survey for species credit species has been completed as part of previous assessments across the study area (Travers 2017 and 2019a) and more recent vegetation mapping revisions were undertaken by ELA in 2021. Three species credit species have been assumed as present or recorded within the study area: *Chalinolobus dwyeri* (Large-eared Pied Bat), *Litoria aurea* (Green and Golden Bell Frog) and *Myotis macropus* (Southern Myotis). One endangered population was also assumed present:

Marsdenia viridiflora subsp. *viridiflora* - endangered population (*Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas).

Table 1: Summary of ecosystem credits required to offset residual impacts of the proposed development

PCT ID	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
835	Cumberland riverflat forest	Forested Wetlands	0.08	2
850	Cumberland shale hills woodland	Grassy Woodlands	0.37	11

Table 2: Summary of species credits required to offset residual impacts of the proposed development

Species	Common Name	Direct impact / habitat (ha)	Credits required
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	0.22 ha	7
<i>Litoria aurea</i>	Green and Golden Bell Frog	0.22 ha	5
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	<i>Marsdenia viridiflora</i> R. Br. subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	0.14 ha	3
<i>Myotis macropus</i>	Southern Myotis	0.22 ha	5

Three Matters of National Environmental Significance (MNES) listed under the EPBC Act were considered as likely or having potential to occur in the development site. The Significant Impact Criteria was applied to *Pteropus poliocephalus* (Grey-headed Flying-fox), *Chalinolobus dwyeri* (Large-eared Pied Bat) and *Litoria aurea* (Green and Golden Bell Frog). Assessments were also carried out for Critically Endangered Ecological Communities - *Cumberland Plain Woodland in the Sydney Basin Bioregion* and *River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria* and concluded that the proposed development is unlikely to constitute a significant impact on MNES.

Contents

1. Stage 1: Biodiversity assessment.....	1
1.1 Introduction.....	1
1.1.1 General description of the development site	1
1.1.2 Development site footprint	1
2. Legislative context.....	5
3. Methodology.....	7
3.1.1 Literature and Data Reviews.....	7
3.2 Landscape features.....	7
3.2.1 IBRA regions and subregions	7
3.2.2 Native vegetation extent	7
3.2.3 Rivers and streams.....	7
3.2.4 Wetlands	8
3.2.5 Connectivity features	8
3.2.6 Areas of geological significance and soil hazard features.....	8
3.2.7 Site context	8
3.3 Native vegetation	8
3.3.1 Survey effort	8
3.3.2 Plant Community Types present.....	10
3.3.3 Plant Community Type selection justification	14
3.3.4 Vegetation integrity assessment	15
3.3.5 Streamlined assessment module – Planted native vegetation.....	15
3.3.6 Use of local data	15
3.4 Threatened species.....	18
3.4.1 Ecosystem credit species	18
3.5 Species credit species	23
3.5.1 Targeted surveys.....	34
3.5.2 Species Credits Included in this Assessment.....	37
3.5.3 Use of local data	37
3.5.4 Expert reports	37
4. Stage 2: Impact assessment (biodiversity values).....	40
4.1 Avoiding impacts.....	40
4.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat.....	40
4.1.2 Prescribed biodiversity impacts.....	41
4.2 Assessment of Impacts	43
4.2.1 Direct impacts	43
4.2.2 Change in vegetation integrity.....	44

4.2.3 Indirect impacts	44
4.2.4 Prescribed biodiversity impacts	45
4.2.5 Mitigating and managing impacts	46
4.2.6 Serious and Irreversible Impacts (SAII)	50
4.3 Risk assessment	53
4.4 Impact summary	57
4.4.1 Serious and Irreversible Impacts (SAII)	57
4.4.2 Impacts requiring offsets	57
4.4.3 Impacts not requiring offsets	57
4.4.4 Areas not requiring assessment	58
4.4.5 Credit summary	58
4.5 Consistency with legislation and policy	62
4.5.1 <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	62
4.5.2 Vulnerable Species	63
<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox)	63
<i>Chalinolobus dwyeri</i> (Large-eared Pied Bat)	63
<i>Litoria aurea</i> (Green and Golden Bell Frog)	63
4.5.3 <i>Critically Endangered Ecological Community</i>	66
<i>Cumberland Plain Woodland in the Sydney Basin Bioregion</i>	66
<i>River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria</i>	66
5. References	69
Appendix A: Definitions	70
Appendix B: Vegetation plot data	73
Appendix C: EPBC Act Likelihood of Occurrence	75
Appendix D: Biodiversity credit report	98

List of Figures

Figure 1: Site Map	3
Figure 2: Location Map	4
Figure 3: Plant Community Types and development footprint	16
Figure 4: Plot locations	17
Figure 5: Targeted surveys	38
Figure 6: Species polygons	39
Figure 7: Final project footprint	56
Figure 8: Impacts requiring offset	59
Figure 9: Areas not requiring offset	60
Figure 10: Areas not requiring assessment	61

List of Tables

Table 1: Legislative context	5
Table 2: Native vegetation extent.....	7
Table 3: Rivers and streams	7
Table 4: Percent native vegetation cover in the landscape	8
Table 5: Full-floristic PCT identification plots.....	9
Table 6: Vegetation integrity plots.....	9
Table 7: Plant Community Types.....	10
Table 8: Threatened Ecological Communities	11
Table 9: PCT selection justification (Travers 2019a)	14
Table 10: Vegetation integrity.....	15
Table 11: Predicted ecosystem credit species	18
Table 12: Candidate species credit species.....	23
Table 13: Travers species credit species and threatened flora survey effort (Travers 2019a).	34
Table 14: Travers birds survey effort (Travers 2019a).	35
Table 15: Travers Bushfire and Ecology nocturnal birds, microbats and arboreal mammals survey effort (Travers 2019a).	36
Table 16: Travers Bushfire and Ecology reptiles and amphibians survey effort (Travers 2019a).....	36
Table 17: Travers Bushfire and Ecology invertebrate survey effort (Travers 2019a).	36
Table 18: Weather conditions.....	37
Table 19: Species credit species included in the assessment	37
Table 20: Locating and designing a project to avoid and minimise impacts on vegetation and habitat.	40
Table 21: Prescribed biodiversity impacts	42
Table 22: Locating and designing a project to avoid and minimise prescribed biodiversity impacts.....	42
Table 23: Direct impacts to native vegetation	43
Table 24: Direct impacts on threatened ecological communities	43
Table 25: Direct impacts on threatened species and threatened species habitat	43
Table 26: Change in vegetation integrity	44
Table 27: Indirect impacts.....	44
Table 28: Direct impacts on prescribed biodiversity impacts	45
Table 29: Measures proposed to mitigate and manage impacts.....	46
Table 30: Candidate Serious and Irreversible Impact entities	50
Table 31: Determining whether impacts are serious and irreversible.....	50
Table 32: Evaluation of an impact on a TEC – Cumberland Plain Woodland.....	51
Table 33: Likelihood criteria	53
Table 34: Consequence criteria.....	54
Table 35: Risk matrix	54
Table 36: Risk assessment.....	54
Table 37: Impacts to native vegetation that require offsets	57
Table 38: Impacts on threatened species and threatened species habitat that require offsets.....	57
Table 39: Ecosystem credits required	58
Table 40: Species credit summary.....	58
Table 41: EPBC Act Assessment for Vulnerable species.....	64

Table 42: EPBC Act Assessment for CEEC.....	67
Table 43: Likelihood of occurrence for threatened entities	76

Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
CEEC	Critically Endangered Ecological Community
DNG	Derived Native Grassland
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DPIE	NSW Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
LLS	Local Land Service
NSW	New South Wales
NRAR	NSW Natural Resources Access Regulator
EESG	NSW Environment, Energy and Science
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
WM Act	NSW <i>Water Management Act 2000</i>

1. Stage 1: Biodiversity assessment

1.1 Introduction

This Biodiversity Development Assessment Report (BDAR) has been prepared by Janene Devereux, who is an Accredited Person under the NSW *Biodiversity Conservation Act 2016* (BC Act) (Accreditation BAAS19045). This document is approved by Meredith Henderson (Accreditation BAAS17001).

A BDAR was prepared for the study area by Travers Bushfire and Ecology (hereafter referred to as Travers) in 2019. Field methodologies and results are provided in Travers 2019 and reproduced within this BDAR for context.

1.1.1 General description of the development site

The proposed development site is defined as the area of land subject to the proposed development application DA 19-0875. This study area is located at 13 Park Road, Wallacia (Lot 2 DP 1108408 and Lot 3 and 4 DP18701) in the City of Penrith local government area (LGA).

The study area contains an operational golf course and associated club house infrastructure, paths, and parking areas. The study area is zoned as E3 under the Penrith Local Environment Plan (LEP) 2010 and has a total area of 13.10 ha.

This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2).

1.1.2 Development site footprint

As outlined in Travers (2019a), the proposed redevelopment involves three parts:

- Redesign of the existing golf course and retention of the existing workshop / maintenance shed. This will involve rehabilitation of the creek line vegetation and threatened ecological communities (TEC) throughout the site (in accordance with the Vegetation Management Plan).
- Alterations and additions to the existing club including a new pool, gym, deck and terrace with internal refurbishments including a golf pro shop, function rooms, lounge and gaming area.
- The development of Nepean Memorial Park within the eastern portion of the site. This will include the construction of a multipurpose chapel and administration office, burial sites as well as the associated road network.

The western portion of the study area will be retained and existing fairways partial reconfigured.

The eastern portion will be used for a cemetery. The proposed development involves the construction of the following built facilities:

- A multipurpose chapel
- An administration office
- Alterations and additions to the existing clubhouse and
- Reuse of existing workshop building.

A road network has been designed to allow access to each of the cemetery facilities and access to the various proposed burial and memorial sites throughout. The development site also includes asset

protection zones. Please refer to Figure 3 for the proposed development footprint. Any works confined to the areas within the development footprint are hereafter referred to as the 'development site'.

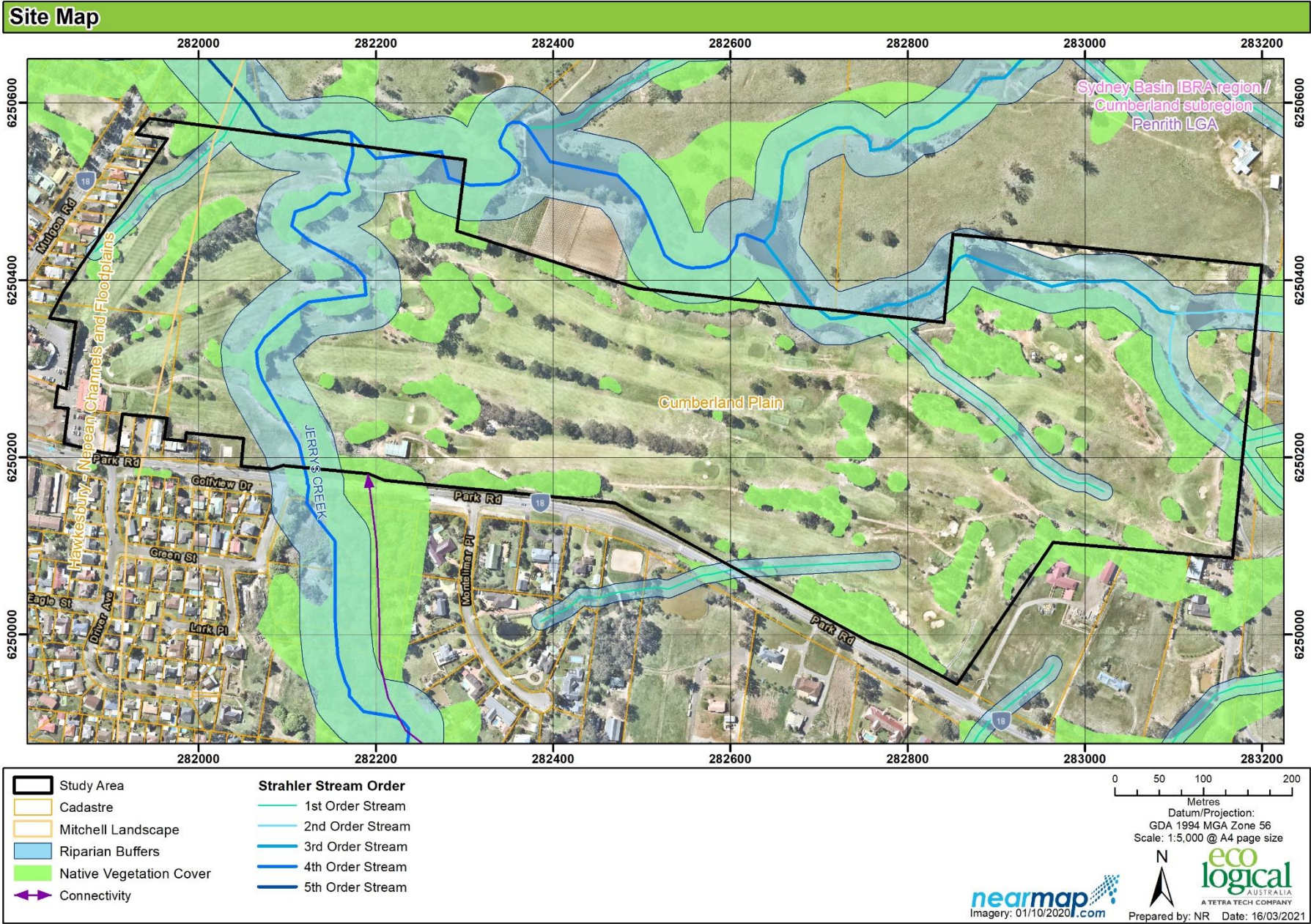


Figure 1: Site Map

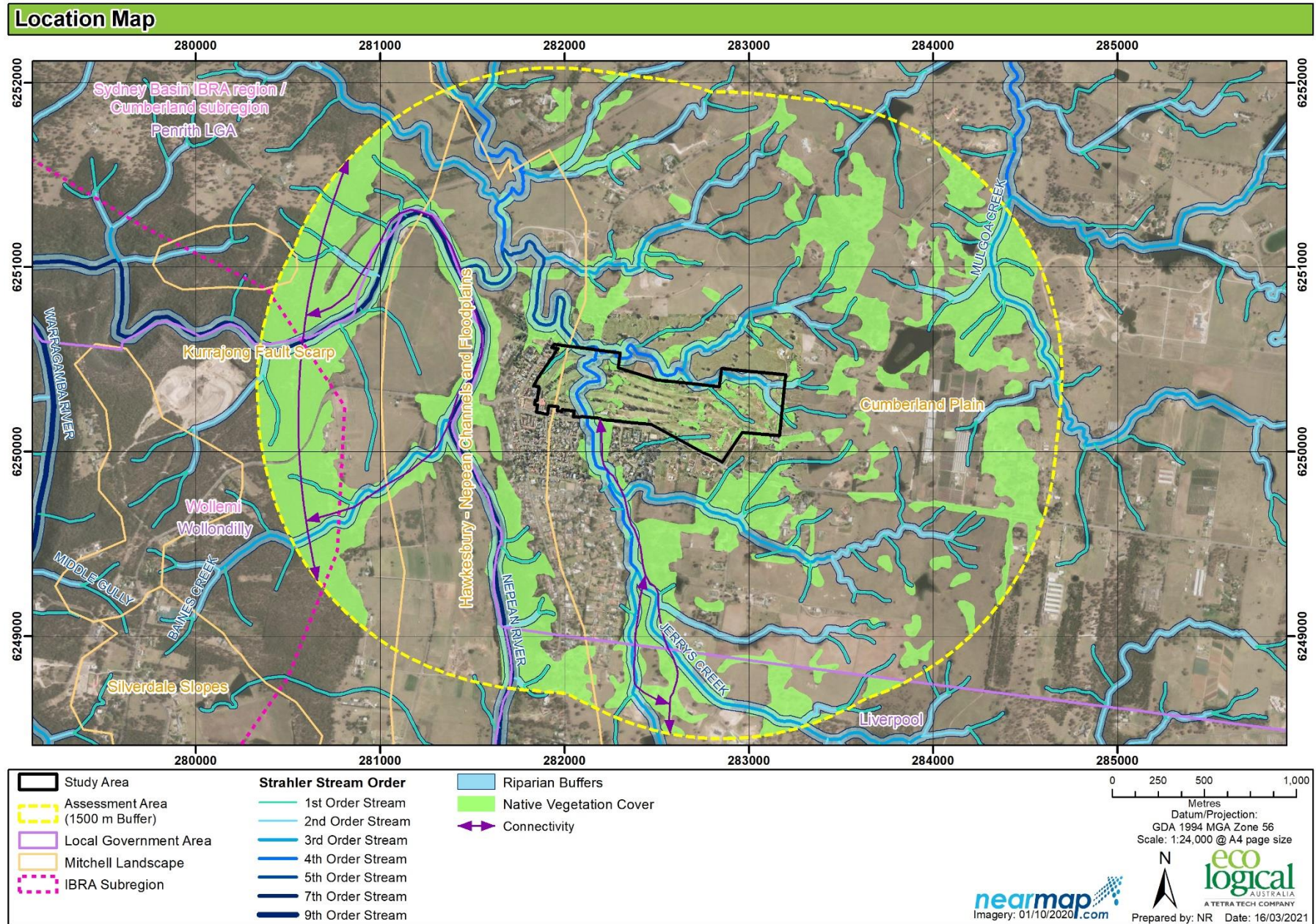


Figure 2: Location Map

2. Legislative context

Table 1: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999	Matters of national Environmental Significance have been identified on or near the development site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES.	Section 4.5
State		
Environmental Planning and Assessment Act 1979	The proposed development requires consent under the (Penrith Local Environmental Plan 2010 (LEP) and is to be assessed under Part 4 of the EP&A Act.	Section 1
Biodiversity Conservation Act 2016	The proposed development exceeds the BAM threshold and requires submission of a Biodiversity Development Assessment Report.	Entire report
Fisheries Management Act 1994	The development does not involve impacts to Key Fish Habitat, does not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is not required.	N/A
Local Land Services Amendment Act 2016	The LLS Act does not apply to areas of the state to which the SEPP Vegetation applies. The Vegetation SEPP applies to the Penrith local government area.	N/A
Water Management Act 2000	The project involves works on waterfront land and therefore requires a Controlled Activity Approval under s91 of the WM Act	N/A
Planning Instruments		
Vegetation SEPP	The Vegetation SEPP applies to development that does not require consent. As this project requires consent under the Penrith City Council LEP, the Vegetation SEPP is not relevant.	N/A
Coastal Management SEPP	The proposed development is not located on land subject to the Coastal Management SEPP	N/A
State Environmental Planning Policy (Koala Habitat Protection) 2020	The proposed development is not located within a LGA to which the SEPP Koala Habitat Protection applies.	N/A
Penrith Local Environment Plan	The development site is zoned E3 under the Penrith LEP 2010.	N/A
Penrith City Council Development Control Plan (DCP)	<p>The Penrith City Council DCP contains provisions relating to native vegetation. Section C2-2.1 states that the objective of protecting trees and other vegetation where possible is to:</p> <ol style="list-style-type: none"> To protect and conserve the biodiversity values of trees and other vegetation in the City, To maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change, To support conservation and threat abatement action to minimise biodiversity loss and conserve threatened species and ecological communities in nature, To protect and enhance biodiversity corridors, landscape character and scenic values of the City, 	N/A

Name	Relevance to the project	Report Section
	<ul style="list-style-type: none"> e. Recognise the importance and function of trees and other vegetation for Cooling our City, f. To preserve the amenity of the City through the preservation of trees and other vegetation, g. To preserve existing trees and other vegetation where possible during the planning, design, development and construction process, h. To firstly avoid or minimise impacts of a proposed development and land use change on biodiversity and if impacts are unavoidable provide appropriate offsets, i. To achieve an appropriate balance between the protection of trees and other vegetation and mitigating risks from natural hazards. 	

3. Methodology

3.1.1 Literature and Data Reviews

A BDAR was prepared in 2019 for a previous development footprint within the development site by Travers (2019a). Survey data, including methodologies and results, collected from this previous assessment is utilised within this report to inform ecological constraints for the project.

The following data sources were reviewed by ELA as part of this report:

- Biodiversity Assessment Method Calculator
- BioNet Vegetation Classification 2021
- Additional GIS datasets including soil, topography, geology and drainage
- Flora and Fauna Assessment Report (Travers 2017)
- Biodiversity Development Assessment Report (Travers 2019a)
- Tree Assessment (Travers 2019b).
- Vegetation Management Plan (Travers 2019c).

3.2 Landscape features

3.2.1 IBRA regions and subregions

The development site falls within the Sydney Basin IBRA region and the Cumberland Plain IBRA subregions.

3.2.2 Native vegetation extent

The extent of native vegetation within the development site and buffer is outlined in Table 2. Thirty-one percent was entered in the BAMC tool for native vegetation extent.

Table 2: Native vegetation extent

Native vegetation cover within the development site (ha)	Native vegetation within the 1,500 m buffer area (ha)	Total area within the buffer (ha)	Percent native vegetation cover within the buffer area (%)
10.54	1,267.7	392.9	31

There are no differences between the mapped vegetation extent and the aerial imagery.

3.2.3 Rivers and streams

The development site contains rivers and streams as outlined in Table 3. Watercourses and stream buffers are mapped on the Site Map (Figure 1) and the Location Map (Figure 2).

Table 3: Rivers and streams

River / stream	Strahler stream order	Riparian buffer
Jerrys Creek	2	20 m
Unnamed first order drainage	1	10 m

3.2.4 Wetlands

As outlined in Travers (2019a), the study area contains four waterbodies. These waterbodies have been constructed and therefore do not conform to a natural wetland community or threatened wetland ecological community.

3.2.5 Connectivity features

As per Travers (2019a), fragmented connectivity features exist along the main drainage line (Jerrys Creek) to the north and west towards the Nepean River. This river then connects to Burragorang State Conservation Area and the Blue Mountains National Park. Vegetation bordering this river is likely to provide habitat for highly mobile species such as birds and microchiropteran bats (microbats).

Connectivity features also exist from the east to the north of the study area (see Figure 1 and 2).

3.2.6 Areas of geological significance and soil hazard features

The study area does not contain karst, caves, crevices, cliffs or other areas of geological significance. The study area does not contain soil hazard features.

3.2.7 Site context

3.2.7.1 Method applied

The site-based method has been applied to this development.

3.2.7.2 Percent native vegetation cover in the landscape

The current percent native vegetation cover in the landscape was assessed in a Geographic Information System (GIS) using aerial imagery sourced from Six Maps using increments of 5%. The percent native vegetation cover within the assessment area (1267.7 ha) is 30.99% (392.9 ha) (Table 3).

The results of this analysis are shown in Table 4.

Table 4: Percent native vegetation cover in the landscape

Native vegetation within the study area (ha)	Native vegetation cover within the 1,500 m buffer area (%)
10.54	31

3.2.7.3 Patch size

Patch size was calculated using available vegetation mapping for all patches of intact native vegetation on and adjoining the study area. The patch size is greater than 100 ha which falls into the > 101 ha size class consistent with BAM.

3.3 Native vegetation

3.3.1 Survey effort

Vegetation surveys were originally undertaken by Travers in both 2017 and 2019. Initial flora surveys were undertaken on 5 October 2017 which included:

- Random meanders to gain a full species list of the plants within the study area
- Tree assessments

- Nine 20 x 20 m or 10 x 40 m floristic quadrats were undertaken within remnant bushland areas and plantation (Figure 4)
- Threatened species searches were conducted as near linear transects within areas of potential habitat.

Updated botanical surveys were undertaken on 3 December 2019 which included:

- Seven 20 x 50 m BAM vegetation integrity plots were undertaken within vegetation directly affected by the original impact footprint (Figure 4)
- Revision of 2017 vegetation mapping.

Additional surveys were conducted by ELA on 8 March 2021 which included the revision of 2019 vegetation mapping (Travers 2019a). This revised mapping was designed to be consistent with the requirements of BAM 2020.

Across 2017, 2019 and 2021, a total of 16 full-floristic vegetation plots were surveyed to identify PCTs and TECs on the study area (Table 5). A total of nine vegetation integrity plots were undertaken within the study area consistent with BAM minimum plots required per vegetation zone (Table 6).

All field data collected by Travers (2019a) at full-floristic and vegetation integrity plots is included in Appendix B:.

Table 5: Full-floristic PCT identification plots

PCT ID	PCT Name	Number of plots surveyed
835	Cumberland riverflat forest	5
850	Cumberland shale hills woodland	7
-	Native planted vegetation	4
-	Exotic/Ornamental planted vegetation	0

Table 6: Vegetation integrity plots

Veg Zone	PCT ID	PCT Name	Condition	Area of impact (ha)	Plots required	Plots surveyed (Travers 2019a)
1	835	Cumberland riverflat forest	Moderate - poor	0.08	1	1
2	850	Cumberland shale hills woodland	Moderate - poor	0.14	1	2
3	850	Cumberland shale hills woodland	Poor – no understorey	0.23	1	1
4	-	Native planted vegetation	Poor – planted	0.80	1	3
5	-	Exotic/Ornamental planted vegetation	Poor	0.22	0	0

3.3.2 Plant Community Types present

A total of two PCTs were identified within the study area (Table 7, Figure 3). Of these, both PCTs are listed TECs under the BC Act and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Table 8). Justification for the selection of PCTs occurring on the study area is based on a quantitative analysis of full-floristic plot data (Travers 2019a) and is provided in Table 9. Example photos of the communities allocated are provided in Photo 1 to Photo 6 below. Field surveys conducted by ELA in March 2021 made adjustments to PCT allocation within the study area, including the mapping of all exotic/ornamental vegetation and the refinement of planted native vegetation across the study area.

It has been estimated that all 3.04 ha of PCT 835 within the study area corresponds with the NSW BC Act listed Endangered Ecological Community (EEC), *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (see Table 11). This community is also listed as Critically Endangered under the EPBC Act as *River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria*.

It has also been estimated that 2.31 ha of PCT 850 within the study area corresponds with the NSW BC Act listed Critically Endangered Ecological Community (CEEC), *Cumberland Plain Woodland in the Sydney Basin Bioregion* (CPW) (see Table 11). This community is also listed as Critically Endangered under the EPBC Act as *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*.

Native planted vegetation is also present within study area. This community consists of locally-occurring species, such as *E. tereticornis*, *E. moluccana*, *E. crebra*, *E. punctata* and *E. fibrosa*, along with species that would not naturally occur within the site, such as *Lophostemon confertus*, *Grevillea robusta*, *Melaleuca quinquenervia* and *Callistemon viminalis*. The total area of native planted vegetation is 5.20 ha.

Exotic and/or ornamental species also occur within the study area. Species recorded include exotic species such as *Pinus radiata* and *Cinnamomum camphora*, and ornamental species such as *Corymbia citriodora*. The total area of exotic/ornamental within the study area is 2.16 ha.

Table 7: Plant Community Types

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area (ha)	Percent cleared (%)
835	Cumberland riverflat forest	Coastal Floodplain Wetlands	Forested Wetlands	3.04	0.93
850	Cumberland shale hills woodland	Coastal Valley Grassy Woodlands	Grassy Woodlands	2.31	0.93
NA	Native planted vegetation	-	-	5.20	NA
NA	Exotic/Ornamental planted vegetation	-	-	2.16	NA

Table 8: Threatened Ecological Communities

PCT ID	BC Act			EPBC Act		
	Listing status	Name	Area (ha)	Listing status	Name	Area (ha)
835	Endangered Ecological Community	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion	3.04	Critically Endangered	River- flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.	3.04
850	Critically Endangered Ecological Community	Cumberland Plain Woodland in the Sydney Basin Bioregion	2.31	Critically Endangered	Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	2.31

**Photo 1** An example of vegetation mapped as PCT 835 - Cumberland riverflat forest within plot G1 (Photo from Travers 2019a)



Photo 2 An example of vegetation mapped as PCT 835 - Cumberland riverflat forest along Jerrys Creek (Photo from Travers 2019a)



Photo 3 An example of vegetation mapped as PCT 850 – Moderate Condition - Cumberland shale hills woodland (Photo from Travers 2019a)



Photo 4 An example of vegetation mapped as PCT 850 – Low-No Midstorey - Cumberland shale hills woodland (Photo from Travers 2019a)



Photo 5 An example of planted native vegetation within plot G5 (Photo from Travers 2019a)



Photo 6 An example of exotic/ornamental vegetation, including pine trees (*Pinus radiata*)

3.3.3 Plant Community Type selection justification

Justification for the PCTs within the study area is provided within Travers 2019a. Interim Biogeographic Regionalisation for Australia (IBRA) region and sub-region allowed for the narrowing of potential community types. The assessment of dominant canopy, mid-storey and ground cover species through the BioNet Vegetation Classification Tool, including the landscape position, allowed for the allocation of each PCT. The justification for this allocation is provided below in Table 9.

Table 9: PCT selection justification (Travers 2019a)

PCT ID	PCT Name	Selection criteria	Species relied upon for identification of vegetation type and relative abundance (Travers 2019a)
850	Cumberland shale hills woodland	<p>The IBRA region, subregion, soil landscape and landscape position of the study area correspond to those listed for the PCT under the BioNet Vegetation Classification.</p> <p>Results of floristic plot analysis including the presence of positive diagnostic canopy species</p>	<p>Presence of <i>E. moluccana</i> and <i>E. tereticornis</i> within the canopy and <i>Microlaena stipoides</i> and <i>Themeda triandra</i> in the ground strata.</p> <p>Canopy and mid-strata species presence, combined with the presence of <i>Acacia implexa</i>, which is diagnostic for this PCT. Correct landscape position (hills and rises).</p>
835	Cumberland riverflat forest	<p>The IBRA region, subregion, soil landscape and landscape position of the study area correspond to those listed for the PCT under the BioNet Vegetation Classification.</p> <p>Results of floristic plot analysis including the presence of positive diagnostic canopy species</p>	<p>Presence of <i>E. tereticornis</i> and <i>E. amplifolia</i> as upper strata within the Cumberland Plain subregion. This PCT was considered a match due to the presence of <i>E. amplifolia</i>, <i>Acacia parramattensis</i> and <i>Bursaria spinosa</i>. Landscape requirements were also met, with vegetation locations within alluvial flats along streams and creeks.</p>

Field surveys conducted by ELA in March 2021 confirmed allocated PCTs within the study area and concur with the justification provided by Travers (2019a).

3.3.4 Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 10.

Table 10: Vegetation integrity

Veg Zone	PCT ID	Condition	Impact Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	835	Moderate-poor	0.08	44.8	17.6	100	42.9
2	850	Moderate-poor	0.14	35.3	27.0	81.3	42.6
3	850	Low – No Midstorey	0.23	28.0	68.5	73.5	52.1

3.3.5 Streamlined assessment module – Planted native vegetation

Section 2.2 of BAM 2020 contains a streamlined assessment module for planted native vegetation. The streamlined assessment can be used where native vegetation was planted for purposes such as street trees and other roadside plantings, windbreaks, landscaping in parks and gardens, and revegetation for environmental rehabilitation.

The streamlined assessment module for planted native vegetation has been applied to part of the development site where areas of planted native vegetation will be affected.

The planted native vegetation within the development site has been planted for the purpose of landscape plantings in the golf course grounds. Appendix D of BAM provides a decision-making key for the assessment of the planted native vegetation. This decision-making key was applied to the sections of planted native vegetation mapped within the development site. Following the decision key, the most appropriate result is D.1.5 since the planted vegetation is considered to be for functional and aesthetic purposes. Therefore, for those patches identified as planted native vegetation the use of Chapters 4 (native vegetation integrity plots) and 5 (threatened species assessment) are not required to be applied. The planted native vegetation must be assessed for threatened species habitat and suitable minimisation and mitigation measures must be applied (see Section 4 for details).

3.3.6 Use of local data

The use of local data is not proposed.

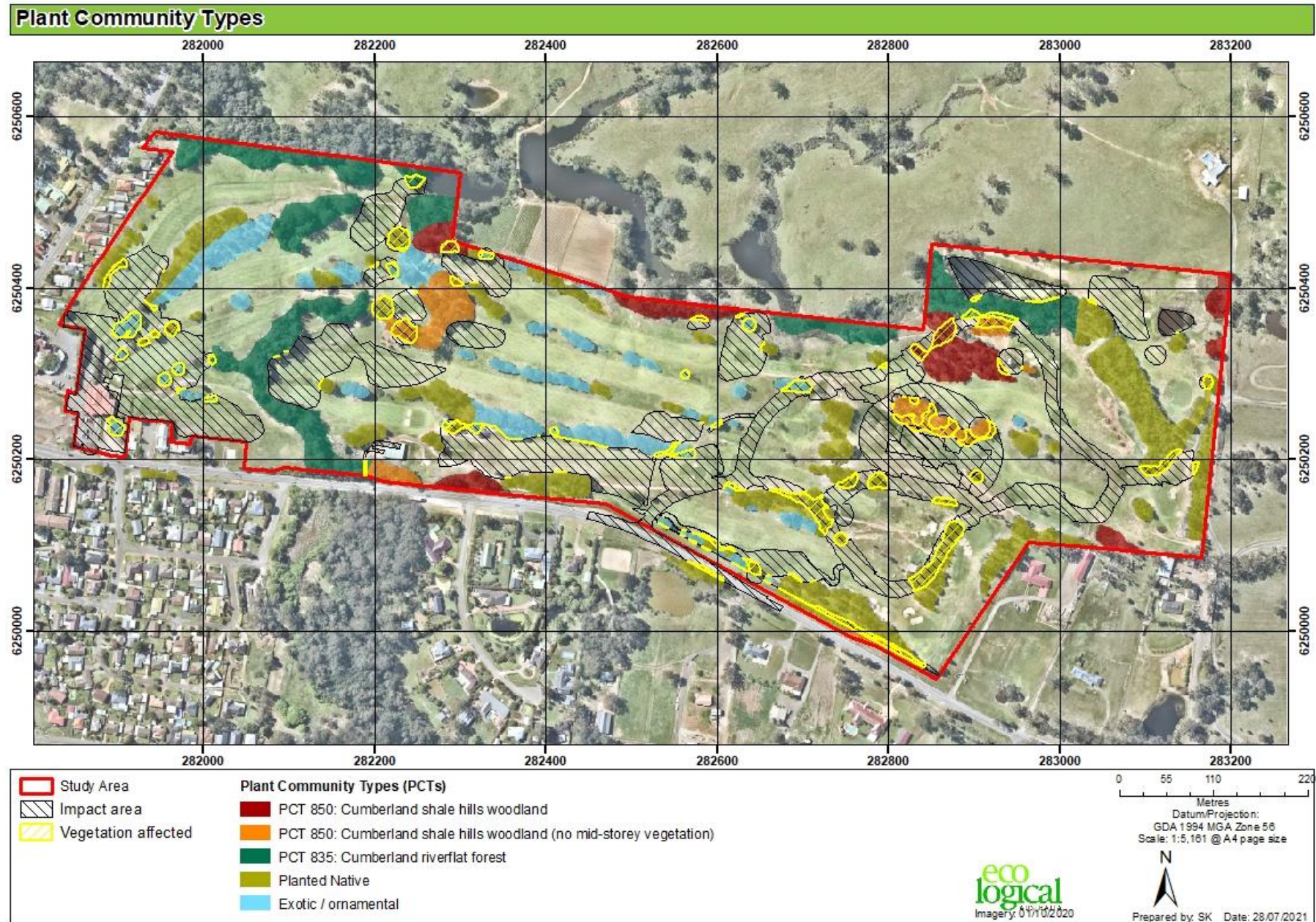


Figure 3: Plant Community Types and development footprint

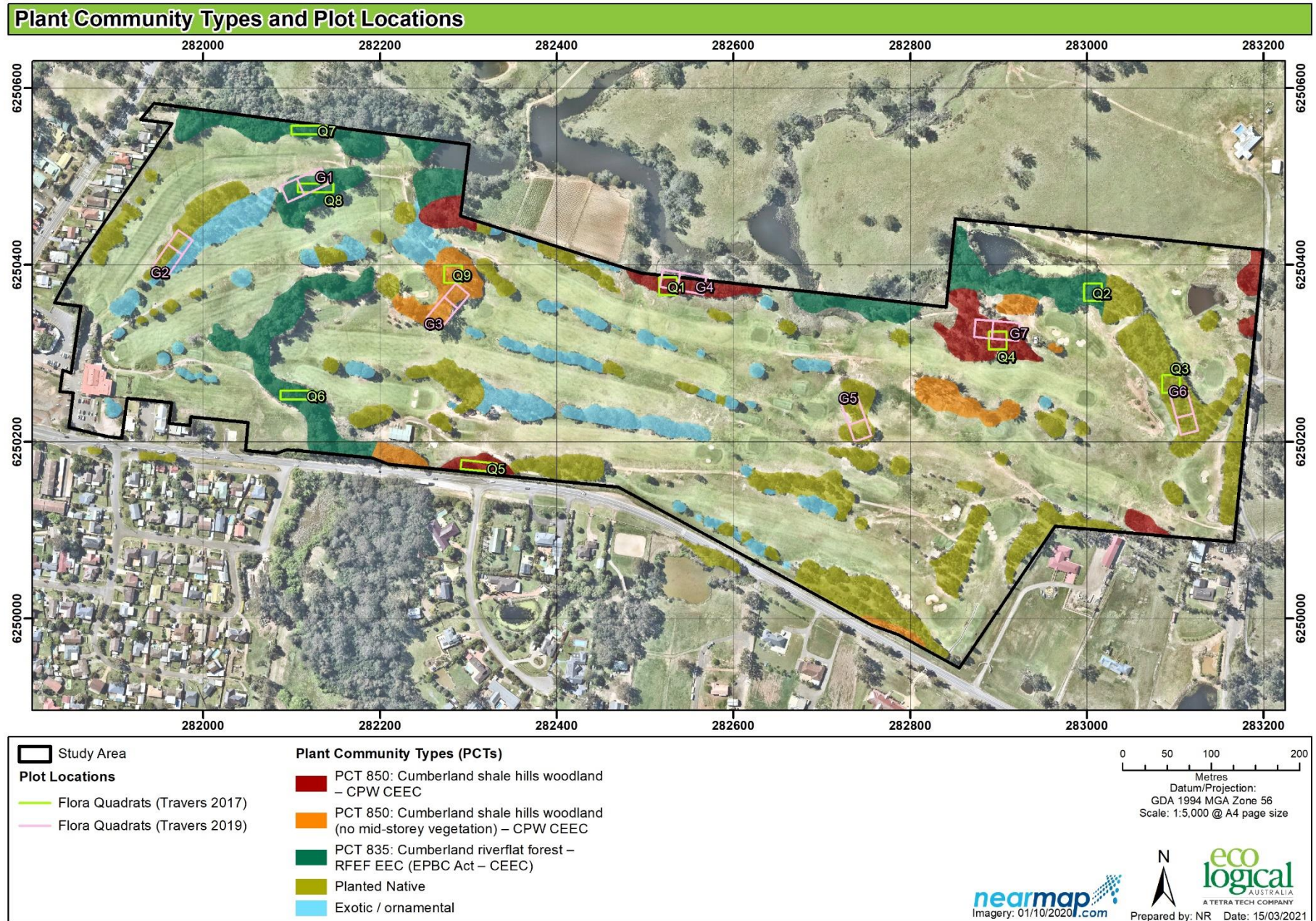


Figure 4: Plot locations

3.4 Threatened species

3.4.1 Ecosystem credit species

Ecosystem credit species predicted to occur at the study area, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 11. Ecosystem credit species which have been excluded from the assessment and relevant justification are also included in Table 11.

Table 11: Predicted ecosystem credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species
<i>Anthochaera phrygia</i>	Regent Honeyeater (Foraging)	As per OEH mapped areas	-	High	Critically Endangered	Critically Endangered	<u>Included</u> Potential foraging habitat exists within the study area
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	-	-	Moderate	Vulnerable	Not listed	<u>Included</u> Potential habitat exists within the study area
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo (Foraging)	-		Moderate	Vulnerable	Not listed	<u>Included</u> Potential foraging habitat exists within the study area
<i>Chthonicola sagittata</i>	Speckled Warbler	-	-	High	Vulnerable	Not listed	<u>Included</u> Potential habitat exists within the study area
<i>Circus assimilis</i>	Spotted Harrier	-	-	Moderate	Vulnerable	Not listed	<u>Included</u> Potential habitat exists within the study area
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	-	-	High	Vulnerable	Not listed	<u>Included</u> Potential habitat exists within the study area
<i>Daphoenositta chrysoptera</i>	Varied Sittella	-	-	Moderate	Vulnerable	Not listed	<u>Included</u>

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species
							Potential habitat exists within the study area
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	-	-	High	Vulnerable	Endangered	<u>Included</u> Potential habitat exists within the study area
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	-	-	High	Vulnerable	Not listed	<u>Included</u> Potential habitat exists within the study area
<i>Glossopsitta pusilla</i>	Little Lorikeet	-	-	High	Vulnerable	Not listed	<u>Included</u> Potential habitat exists within the study area
<i>Grantiella picta</i>	Painted Honeyeater	Mistletoes present at a density of >5 mistletoes per ha	-	Moderate	Vulnerable	Vulnerable	<u>Excluded</u> According to Travers (2019a), Mistletoe was not recorded within the study area. Painted Honeyeaters are unlikely to utilise the site for foraging. Additionally, this species was not detected during targeted surveys.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Waterbodies Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	-	High	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Hieraetus morphnoides</i>	Little Eagle	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Ixobrychus flavicollis</i>	Black Bittern	Waterbodies	-	Moderate	Vulnerable	Not Listed	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species
		Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation					Potential habitat exists within the study area
<i>Lathamus discolor</i>	Swift Parrot	As per OEH mapped areas	-	Moderate	Endangered	Critically Endangered	<u>Excluded</u> The study area is not within any OEH mapped areas for this species. It was not detected during field surveys.
<i>Lophoictinia isura</i>	Square-tailed Kite	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the development site
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	-	-	High	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the development site. Additionally, this species was recorded during targeted surveys
<i>Miniopterus australis</i>	Little Bent-winged Bat (Foraging)	-	-	High	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	-	-	High	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area. Additionally, this species was recorded during targeted surveys
<i>Neophema pulchella</i>	Turquoise Parrot	-	-	High	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Ninox connivens</i>	Barking Owl (Foraging)	-	-	High	Vulnerable	Vulnerable	<u>Included</u> Potential foraging habitat exists within the study area
<i>Ninox strenua</i>	Powerful Owl (Foraging)	-	-	High	Vulnerable	Vulnerable	<u>Included</u> Potential foraging habitat exists within the study area
<i>Pandion cristatus</i>	Eastern Osprey (Foraging)	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Potential foraging habitat exists within the study area
<i>Petaurus australis</i>	Yellow-bellied Glider	Hollow bearing trees Hollows > 25cm diameter	-	High	Vulnerable	Not Listed	<u>Included</u> Hollows exist within the study area, however, no large hollows suitable for large gliders or forest owls were recorded within the study area. Foraging habitat does occur, however.
<i>Petroica boodang</i>	Scarlet Robin	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Petroica phoenicea</i>	Flame Robin	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u>

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species
							Potential habitat exists within the study area
<i>Phascolarctos cinereus</i>	Koala (Foraging)	-	-	High	Vulnerable	Vulnerable	<u>Included</u> There is potential foraging habitat within the study area, however, no evidence of use of feed trees such as <i>E. tereticornis</i> or <i>E. punctata</i> during surveys
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Foraging)	-	-	High	Vulnerable	Vulnerable	<u>Included</u> Potential foraging habitat exists within the study area
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	-	-	High	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	-	-	High	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Stagonopleura guttata</i>	Diamond Firetail	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Potential habitat exists within the study area
<i>Tyto novaehollandiae</i>	Masked Owl (Foraging)	-	-	High	Vulnerable	Not Listed	<u>Included</u> Potential foraging habitat exists within the study area

3.5 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 12. Justification for the inclusion or exclusion of species is also provided. The exclusion of species is conducted in accordance with Section 5.2.3.2a of the BAM.

Table 12: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
<i>Acacia pubescens</i>	Downy Wattle	-	-	High	Vulnerable	Vulnerable	<u>Excluded</u> This species was included in the targeted survey. No individuals were recorded. Additionally, the study area is highly degraded and subject to regular maintenance. This species is unlikely to occur.	Absent
<i>Anthochaera phrygia</i>	Regent Honeyeater	As per mapped areas	-	High	Critically Endangered	Critically Endangered	<u>Excluded</u> The study area does not contain mapped important areas for this species and development does not present risk of SAI. The mapped important areas for Regent Honeyeater was accessed on 10.03.2021.	Absent
<i>Burhinus grallarius</i>	Bush Stone-curlew	Fallen/standing dead timber including logs	-	High	Endangered	Not Listed	<u>Excluded</u> This species was included in the targeted survey. No individuals were recorded. Additionally, the study area is highly degraded, and the microhabitat required for this species is not considered to be present within the impact area.	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	-	-	Very High	Endangered	Vulnerable	<u>Excluded</u> This species was included in the targeted survey. No individuals were recorded. Additionally, the study area is highly degraded and subject to regular maintenance. This species is unlikely to occur.	Absent
<i>Callistemon linearifolius</i>	Netted Bottle Brush	-	-	Moderate	Vulnerable	Not Listed	<u>Excluded</u> This species was included in the targeted survey. No individuals were recorded. Additionally, the study area is highly degraded and subject to regular maintenance. This species is unlikely to occur.	Absent
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo (breeding)	Hollow bearing trees; Eucalypt tree species with hollows greater than 9 cm diameter	-	Moderate	Vulnerable	Not Listed	<u>Included</u> Hollow bearing trees are present within the study area. This species, however, was included in the targeted survey. No individuals, or evidence of breeding was recorded. These surveys are considered adequate to assume absence.	Absent
<i>Callocephalon fimbriatum</i> - endangered population	Gang-gang Cockatoo	-	Hornsby and Ku-ring-gai LGAs	High	Endangered Population	Not Listed	<u>Excluded</u> This species was included in the targeted survey. No individuals were recorded.	Absent
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	-	-	Moderate	Vulnerable	Not listed	<u>Excluded</u>	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
							The study area is highly degraded such that this species is unlikely to occur. Additionally,	
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Cliffs Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels	-	Very High	Vulnerable	Vulnerable	<u>Included</u> Potential breeding habitat (i.e. cliffs, caves, rocky areas with outcrops, overhangs, escarpments or crevices) present within a two-kilometre radius of the site. However, SAI assessment for this species applies to 100m buffer around breeding habitat. No potential breeding habitat is present within 100 m of the study area, therefore the development does not pose a risk of SAI.	Present (recorded)
<i>Cynanchum elegans</i>	White-flowered Wax Plant	-	-	High	Endangered	Endangered	<u>Excluded</u> The study area is highly degraded such that this species is unlikely to occur. Regular maintenance of lawns and exotic species highly limiting the growth of understorey species.	Absent
<i>Eucalyptus benthamii</i>	Camden White Gum	-	-	High	Vulnerable	Vulnerable	<u>Excluded</u> No individuals were recorded in threatened species surveys or vegetation surveys.	Absent
<i>Grevillea juniperina</i>	Juniper-leaved Grevillea	-	-	Moderate	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded. Additionally, the	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
							study area is highly degraded and subject to regular maintenance. This species is unlikely to occur.	
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Other Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	-	High	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded. Waterbodies within the study area are unlikely to provide suitable foraging habitat for this species.	Absent
<i>Hibbertia</i> sp. Bankstown	Hibbertia sp. Bankstown	-	-	High	Critically Endangered	Critically Endangered	<u>Excluded</u> No individuals were recorded in threatened species surveys or vegetation surveys.	Absent
<i>Hieraaetus morphnoides</i>	Little Eagle	Nest trees - live (occasionally dead) large old trees within vegetation)	-	Moderate	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded.	Absent
<i>Lathamus discolor</i>	Swift Parrot	As per mapped areas	-	Moderate	Endangered	Critically Endangered	<u>Excluded</u> The study area does not contain mapped important areas for this species and development does not present risk of SAIL. The mapped important areas for Swift Parrot was accessed on 10 March 2021.	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
<i>Litoria aurea</i>	Green and Golden Bell Frog	Semi-permanent/ ephemeral wet areas Within 1km of wet areas/Swamps Within 1km of swamp/ Waterbodies Within 1km of waterbody	-	High	Endangered	Vulnerable	<u>Included</u> Habitat within the study area is considered degraded and waterbodies are man-made. Surveys, however, were deemed unable to confidently assume absence, therefore, presence is assumed.	Present (assumed)
<i>Lophoictinia isura</i>	Square-tailed Kite	Nest Trees	-	Moderate	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded.	Absent
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Marsdenia viridiflora R. Br. subsp. Viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	-	Blacktown, Camden, Campbelltown, Canterbury-Bankstown, Cumberland, Fairfield, Liverpool and Penrith LGAs (as amended from the Determination))	Moderate	Endangered Population	Not Listed	<u>Included</u> Habitat within the study area is considered degraded however, surveys were deemed unable to confidently assume absence, therefore, presence is assumed.	Present (assumed)
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	-	-	High	Endangered	Not Listed	<u>Included</u>	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
							This species was included in the targeted survey. No individuals were recorded. The study area is considered highly degraded and consistent management of understorey	
<i>Miniopterus australis</i>	Little Bent-winged Bat (Breeding)	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave' observation type code 'E nest-roost' with numbers of individuals >500 or from the scientific literature	-	Very High	Vulnerable	Not Listed	<u>Included</u> This species was included within targeted surveys. Microhabitat requirements are located within 2km of the study area. However, SAIL assessment for this species applies to 100m buffer around breeding habitat. No potential breeding habitat is present within 100 m of the study area, therefore the development does not pose a risk of SAIL.	Absent
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	Caves Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	-	Very High	Vulnerable	Not listed	<u>Included</u> This species was recorded within the study area. Additionally, microhabitat features such as caves are present within 2km of the study area.	Present (recorded)

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
		including species records with microhabitat code "IC - in cave "observation type code "E nest-roost "with numbers of individuals >500						
<i>Myotis macropus</i>	Southern Myotis	Hollow bearing trees Within 200 m of riparian zone/Other Bridges, caves or artificial structures within 200 m of riparian zone/ Waterbodies This include rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site	-	High	Vulnerable	Not Listed	<u>Included</u> This species was recorded within the study area. Additionally, microhabitat features such as hollow bearing trees are present within the study area.	Present (recorded)
<i>Ninox connivens</i>	Barking Owl	Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter and	-	High	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded. Large hollows suitable for owl roosts were not recorded within the study area.	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
		greater than 4m above the ground						
<i>Ninox strenua</i>	Powerful Owl	Hollow bearing trees Living or dead trees with hollow greater than 20cm diameter	-	High	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded. Large hollows suitable for owl roosts were not recorded within the study area.	Absent
<i>Pandion cristatus</i>	Eastern Osprey (Breeding)	Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting)	-	Moderate	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded and no large stick nests were observed.	Absent
<i>Persicaria elatior</i>	Tall Knotweed	Semi-permanent/ ephemeral wet areas or within 50 m Swamps or within 50 m Waterbodies including Wetlands, or within 50 m	-	High	Vulnerable	Vulnerable	<u>Excluded</u> The habitat within the study area is considered degraded, and man-made waterbodies are unlikely to provide habitat for this species. This species was not recorded during targeted surveys.	Absent
<i>Persoonia hirsuta</i>	Hairy Geebung	-	-	High	Endangered	Endangered	<u>Excluded</u> No individuals were recorded in threatened species surveys or vegetation surveys.	Absent
<i>Petaurus norfolcensis</i>	Squirrel Glider	-	-	High	Vulnerable	Vulnerable	<u>Included</u>	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
							This species was included in the targeted survey. No individuals were recorded. Additionally, preferred habitat areas of Blackbutt-Bloodwood forest with heath understorey as not recorded within the study area.	
<i>Phascolarctos cinereus</i>	Koala	Other Areas identified via survey as important habitat (see comments)	-	High	Vulnerable	Vulnerable	<u>Included</u> This species was included in the targeted survey. No individuals were recorded.	Absent
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	-	-	High	Endangered	Not Listed	<u>Excluded</u> No individuals were recorded in threatened species surveys or vegetation surveys.	Absent
<i>Pimelea spicata</i>	Spiked Rice-flower	-	-	High	Endangered	Endangered	<u>Included</u> This species was included in the targeted survey. No individuals were recorded. Additionally, the study area is highly degraded and subject to regular maintenance. This species is unlikely to occur.	Absent
<i>Pomaderris brunnea</i>	Brown Pomaderris	-	-	High	Endangered	Vulnerable	<u>Excluded</u> No individuals were recorded in threatened species surveys or vegetation surveys.	Absent
<i>Pommerhelix duralensis</i>	Dural Land Snail	Leaf litter and shed bark or within 50m of	-	High	Endangered	Endangered	<u>Included</u> This species was included in the targeted survey. No individuals	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
		litter or bark Rocky areas Rocks or within 50m of rocks Fallen/standing dead timber including logs Including logs and bark or within 50m of logs or bark					were recorded. The study area is considered highly degraded and consistent management of understorey	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Breeding camps	-	High	Vulnerable	Vulnerable	<u>Included</u> This species was recorded during field surveys; however, no breeding camps were present or are known from the study area.	Present (recorded)
<i>Pultenaea pedunculata</i>	Matted Bush-pea	-	-	High	Endangered	Not Listed	<u>Excluded</u> No individuals were recorded in threatened species surveys or vegetation surveys.	Absent
<i>Thesium australe</i>	Austral Toadflax	-	-	High	Vulnerable	Vulnerable	<u>Excluded</u> No individuals were recorded in threatened species surveys or vegetation surveys.	Absent
<i>Tyto novaehollandiae</i>	Masked Owl	-	-	High	Vulnerable	Not Listed	<u>Included</u> This species was included in the targeted survey. No individuals were recorded. Large hollows suitable for owl roosts were not recorded within the study area.	Absent

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Justification for inclusion or exclusion of species	Presence/ absence in study area
<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell in the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield	-	-	High	Endangered Population	Not Listed	<u>Excluded</u> Not listed in the LGA.	Absent

3.5.1 Targeted surveys

Targeted surveys for species credit species were undertaken at the development site by Travers in 2019. The dates of these surveys are outlined in Table 13 to Table 17 below. The location of targeted surveys are shown on Figure 5, with the results of the surveys shown as individual species polygons on Figure 6. The survey effort included the following:

- Diurnal bird surveys
- Spotlighting and call playback for nocturnal mammals, forest owls and Green and Golden Bell Frog
- Ultrasonic recorders for microbats
- Opportunistic habitat searches for reptiles
- Spotlighting and call identification for amphibians
- Vegetation mapping
- Floristic plots and BAM plots
- Targeted searches.

3.5.1.1 Threatened flora

Surveys for threatened flora were completed by Travers in 2019. Threatened species searches (as relevant) were conducted as near linear transects within areas of potential habitat.

Opportunistic searches were also conducted by ELA ecologists on 8 March 2021.

Details of the targeted threatened flora survey effort is provided below in Table 13.

Table 13: Travers species credit species and threatened flora survey effort (Travers 2019a).

Species	BAM survey period (as per Travers 2019a)	Period surveyed (Travers 2019a)
<i>Grevillea juniperina</i> subsp. <i>Juniperina</i>	All months	5 October 2017 and 3 December 2019
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i>	Nov-Feb	3 December 2019
<i>Pimelea spicata</i>	All months	5 October 2017 and 3 December 2019

ELA confirmed that the vegetation within the development site is highly degraded, and the likelihood of threatened flora listed above in Table 12 and Table 13 is low. The justification provided within Travers 2019a, for the exclusion of species is detailed below.

Caladenia tessellata

This species is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. There is marginal habitat within the study area but the lack of any nearby or recent records within 10 km suggests that there is no potential for this species to occur within the study area.

Callistemon linearifolius

Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW where it grows in dry sclerophyll forest. There is marginal habitat within the study area but the lack of any nearby or recent records within 10 km suggests that there is no potential for this species to occur within the study area. This plant is not cryptic and the level of survey effort would have

uncovered this species is it had been present in the study area. The vegetation present is also not a dry sclerophyll forest type.

***Wahlenbergia multicaulis* - endangered population**

This population is restricted to the Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield LGAs. It does not occur within the Penrith LGA, where the study area is located.

Persicaria elatior

This species grows in damp places especially beside streams and lakes, and occasionally in swamp forest. The study area provides low potential habitat, but the lack of any nearby or recent records within 10 km suggests that there is no potential for this species to occur within the study area. The streams and waterbodies in the study area are highly modified and managed.

Pilularia novae-hollandiae

Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. The watercourses and waterbodies within the study area provides very marginal habitat for this species. The lack of any nearby or recent records within 10 km suggests that there is no potential for this species to occur within the study area. The streams and waterbodies in the study area are highly modified and managed.

Pultenaea pedunculata

A disjunct population of this species occurs on the Cumberland Plain, in woodland on clay or sandy-clay, shale-derived soils. There is potential habitat within Cumberland Shale Hills Woodland within the study area but the lack of any nearby or recent records within 10 km suggests that there is no potential for this species to occur within the study area. Most of the Cumberland Shale Hills Woodland present is highly modified and managed.

***Hibbertia* sp. Bankstown**

This species is known only from Bankstown Airport in Sydney's southern suburbs, within the Bankstown LGA and has no potential to occur within the study area.

3.5.1.2 Diurnal birds

Surveys for threatened birds were completed by Travers in 2017 and 2019. Dates and times of these surveys are provided below in Table 14.

Table 14: Travers birds survey effort (Travers 2019a).

Date	Field survey Technique	Survey Effort (Travers 2019a)
27/9/17	Opportunistic observation	4hrs 1230 - 1630
28/9/17	Opportunistic observation	9hrs 0800 - 1700
29/9/17	Opportunistic observation	6hrs 30min 0830 - 1500
5/10/17	Opportunistic observation	7hrs 30min 1100 - 1830

Date	Field survey Technique	Survey Effort (Travers 2019a)
6/10/17	Opportunistic observation	8hrs 0800 - 1600
9/10/17	Opportunistic observation	2hrs 30min 1430 - 1700
10/10/17	Opportunistic observation	7hrs 30min 0700 - 1630
11/10/17	Opportunistic observation	7hrs 0730 - 1430
29/10/19	Opportunistic observation	5hrs 30min 1100 - 1630
30/10/19	Opportunistic observation	8hrs 0730 – 1530

3.5.1.3 Nocturnal Birds, Microbats and Arboreal Mammals

Targeted survey for nocturnal birds and arboreal mammals was conducted simultaneously by Travers on 5 October 2017. Spotlighting and ultrasonic recorders were utilised to detect bat species on 5 October 2017 and 29 October 2019. Dates and times of these surveys are provided below in Table 15.

Table 15: Travers Bushfire and Ecology nocturnal birds, microbats and arboreal mammals survey effort (Travers 2019a).

Date	Field survey Technique	Survey Effort (Travers 2019a)
05/10/17	Spotlighting and Call Playback	2hrs 30min 1900 - 2130
05/10/17	Ultrasonic recorders (passive monitors x 4)	Overnight – from 1800
29/10/19	Ultrasonic recorders (passive monitors x 2)	Overnight – from 1920

3.5.1.4 Reptiles and Amphibians

Targeted survey for reptiles and amphibians was conducted by Travers Bushfire and Ecology on 5-6 October 2017 and 9 October 2017. Dates and times of these surveys are provided below in Table 16.

Table 16: Travers Bushfire and Ecology reptiles and amphibians survey effort (Travers 2019a).

Date	Field survey Technique	Survey Effort (Travers 2019a)
05/10/17	Opportunistic habitat searches	7hrs 30min 1100 - 1830
05/10/17	Spotlighting and call identification Call playback (Green & Golden Bell Frog)	2hrs 30min 1900 - 2130
06/10/17	Opportunistic habitat searches	8hrs 0800 - 1600
09/10/17	Opportunistic habitat searches	2hrs 30min 1430 - 1700

3.5.1.5 Invertebrates

Targeted survey for invertebrates, such as the Cumberland Plain Land Snail and Dural Land Snail were conducted by Travers Bushfire and Ecology on 5-6 October 2017 and 9 October 2017. Dates and times of these surveys are provided below in Table 17.

Table 17: Travers Bushfire and Ecology invertebrate survey effort (Travers 2019a).

Date	Field survey Technique	Survey Effort (Travers 2019a)
05/10/17	Opportunistic habitat searches	7hrs 30min 1100 - 1830
06/10/17	Opportunistic habitat searches	8hrs 0800 - 1600
09/10/17	Opportunistic habitat searches	2hrs 30min 1430 - 1700

3.5.1.6 Weather Conditions

Weather conditions during the targeted surveys are outlined in Table 18.

Table 18: Weather conditions

Date	Weather details (travers 2019a)
27/9/17	2/8 cloud, gentle NNE wind, no rain, 26°C
28/9/17	3/8 cloud, gentle NW wind, no rain, 26°C
29/9/17	0/8 cloud, calm NNE wind, no rain, 18°C
5/10/17	4/8 cloud, gentle NNE wind, no rain, 23°C
6/10/17	8/8 cloud, light SW wind, no rain, 19°C
9/10/17	3/8 cloud, moderate WSW wind, no rain, 32°C
10/10/17	8/8 cloud, calm S wind, no rain, 15-22°C
11/10/17	8/8 cloud, calm NE wind, showers, 18°C
29/10/19	1/8 cloud, 3-15km/h NE wind, no rain, 13-31°C
30/10/19	1/8 cloud, 2-10km/h NE wind, no rain, 13-33°C
03/12/19*	no rain, 9-30°C

* data not provided within Travers (2019a). Weather data collected from bom.gov.au (BOM 2021).

3.5.2 Species Credits Included in this Assessment

Following completion of targeted surveys, the species credit species included in the assessment are outlined in Table 19.

Table 19: Species credit species included in the assessment

Species	Common Name	Species presence	Geographic limitations	Habitat (ha)	Biodiversity Risk Weighting
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Yes (surveyed)	-	0.22 ha	3
<i>Litoria aurea</i>	Green and Golden Bell Frog	Yes (assumed present)	-	0.22 ha	2
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	<i>Marsdenia viridiflora</i> R. Br. subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Yes (assumed present)	-	0.14 ha	2
<i>Myotis macropus</i>	Southern Myotis	Yes (surveyed)	-	0.22 ha	2

3.5.3 Use of local data

The use of local data is not proposed for this assessment.

3.5.4 Expert reports

Expert reports have not been prepared for this assessment

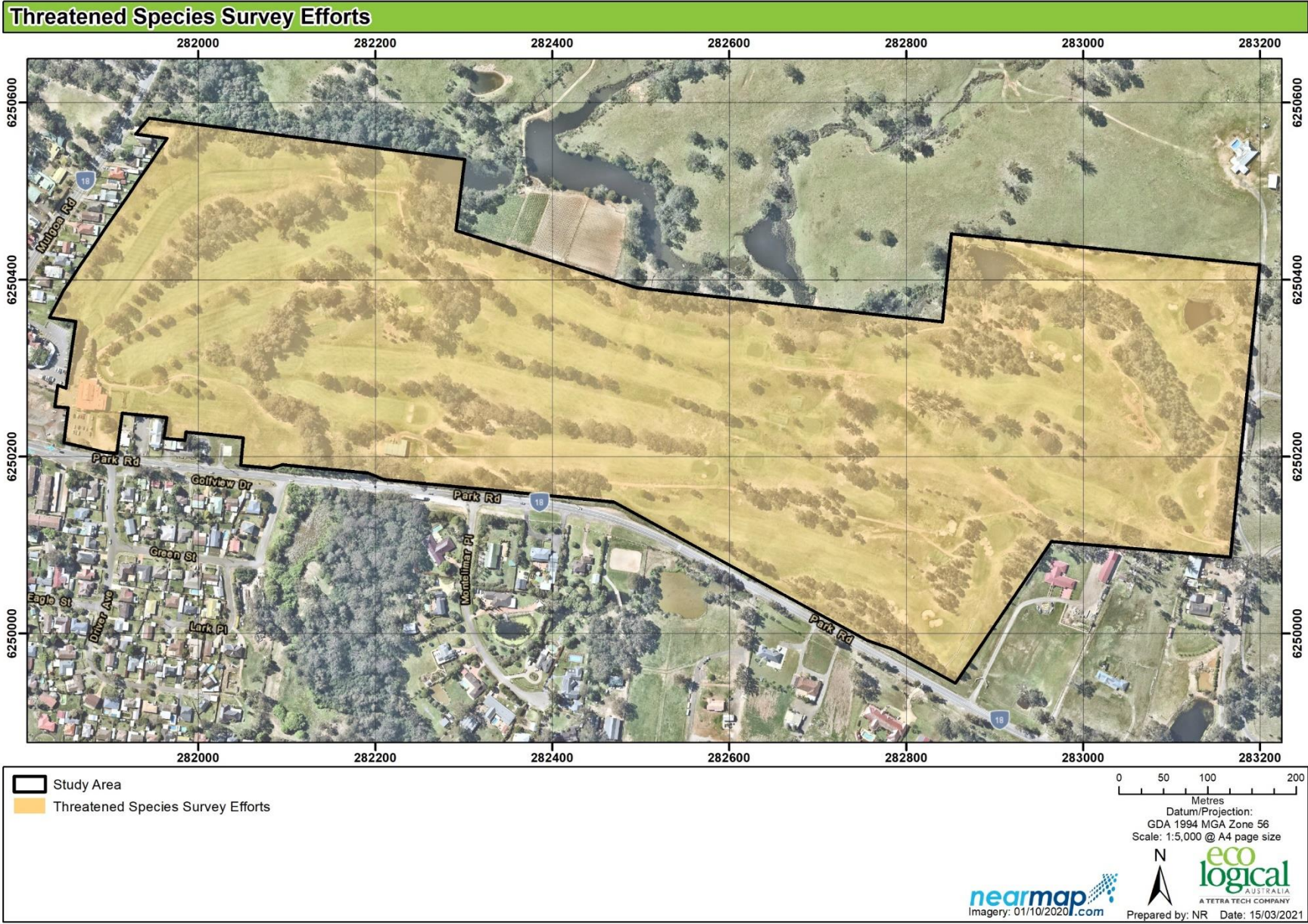


Figure 5: Targeted surveys



Figure 6: Species polygons

4. Stage 2: Impact assessment (biodiversity values)

4.1 Avoiding impacts

4.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

The development has been located and designed in a way which avoids and minimises impacts as outlined in Table 20.

Table 20: Locating and designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed (Travers 2019a)	Justification
locating the project in areas where there are no biodiversity values	The project has used areas where there are few biodiversity values including areas with existing fairways, access roads and existing cleared zones. The project has also used areas with very low biodiversity values such as exotic and degraded vegetation.	Where practical, the development site has been located within areas of existing fairways cleared of native vegetation and in exotic/planted vegetation.
locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition	The project is predominantly located where native vegetation is in degraded or planted and threatened species habitat is considered marginal foraging habitat.	Part of the development site will affect 0.23 ha of native vegetation, which is highly disturbed and comprises mainly a canopy with a highly modified groundlayer and no shrub or midstorey. About 0.22 ha of disturbed native vegetation in a similar state, yet slightly better condition (comprising some occasional shrubs) will also require removal. Areas of good condition native vegetation, where vegetation integrity and habitat for threatened species is highest has been avoided within the development site where possible, leaving 4.83 ha remaining within the study area.
locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	The project has aimed to limit, as far as practical, the removal of vegetation/habitat in high threat categories by locating the majority of the development site within areas of lower quality vegetation (such as planted native vegetation or exotic/ornamental vegetation).	A small amount of Cumberland Plain Woodland (0.38 ha) and River Flat Eucalypt Forest (0.08 ha) will require removal. However, as far as practical, the CEEC (i.e. Cumberland Plain Woodland) has been retained in larger patches to preserve connectivity and limit edge effects (see Figure 3). Only marginal foraging habitat for threatened species in high threat categories will be affected.
locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	The project has been located within an existing and highly modified golf course.	The proposed development has been located to avoid clearing within the good connectivity linkages on site. Connectivity between vegetation within the study area and vegetation extending beyond the study area will

Approach	How addressed (Travers 2019a)	Justification
		be maintained. Connectivity for highly mobile species will also be maintained.
reducing the clearing footprint of the project	The clearing footprint has been revised to reduce the impact to better quality vegetation on site.	The proposed development would remove 0.23 ha of native vegetation which is highly disturbed and comprises mainly of canopy with a highly modified groundlayer and no shrub or midstorey. About 0.22 ha of disturbed native vegetation in a similar state, yet slightly better condition (comprising some occasional shrubs) will also require removal. Areas of good condition native vegetation, where vegetation integrity and habitat for threatened species is highest has been avoided within the development site where possible, leaving 4.83 ha remaining within the study area. .
locating ancillary facilities in areas where there are no biodiversity values or threatened species habitat or habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	There are no ancillary services that require assessment as part of this BDAR. Ancillary services will be located offsite in already disturbed/man-made structures (existing sheds/roads etc)	N/A
providing structures to enable species and genetic material to move across barriers or hostile gaps	Structures to enable species and genetic material to move across barriers will not be constructed.	Connectivity between vegetation within the study area and vegetation extending beyond the study area will be maintained. Connectivity for highly mobile species will also be maintained. Regeneration and enhancement works will also be conducted following construction in accordance with the Vegetation Management Plan.
making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	The development site is to be clearly demarcated to avoid impacts to retained vegetation.	The development site is to be clearly demarcated to avoid impacts to retained vegetation. Any trees planted as part of landscaping works should be consistent with the surrounding native vegetation communities within the study area. The development proposes to carryout enhancement and restoration within the River-flat Eucalypt Forest present.

4.1.2 Prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Table 21.

Table 21: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities effected
impacts of development on the habitat of threatened species or ecological communities associated with: <ul style="list-style-type: none"> non-native vegetation 	The development site contains non-native vegetation canopy which will be removed as part of the proposal. This non-native vegetation is considered to provide marginal foraging habitat for threatened species.	<i>Pteropus poliocephalus</i> (Grey-headed Flying-fox). <i>Anthochaera phrygia</i> (Regent Honeyeater) <i>Lathamus discolor</i> (Swift Parrot)

4.1.2.1 Locating a project to avoid and minimise prescribed biodiversity impacts

The development has been located in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 22.

Table 22: Locating and designing a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Locating and designing the development to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or preferred local movement pathways	The development will involve the removal of some native/planted and exotic vegetation which is likely to provide minimal foraging habitat.	In the context of the surrounding locality, it is considered that vegetation in the impact area is primarily in a disturbed condition and already highly fragmented. Thus, the footprint is considered to be located in an area where exchange of genetic material between adjacent or nearby habitat is already limited and will not affect the corridor connecting different areas of habitat, flight paths or preferred local movement paths. Better quality foraging habitat will be retained in the development footprint.
Optimising project layout to minimise interactions with threatened and protected species and ecological communities	The footprint has been generally placed to avoid impacts to areas of high biodiversity value.	The footprint has utilised the portion of the development site which includes primarily cleared lands and vegetation of lower biodiversity value due to the highly degraded vegetation resulting from past disturbances associated with the golf course.

4.2 Assessment of Impacts

4.2.1 Direct impacts

The direct impacts of the development on:

- native vegetation are outlined in Table 23
- threatened ecological communities are outlined in Table 24
- threatened species and threatened species habitat is outlined in Table 25
- prescribed biodiversity impacts is outlined in Section 4.2.2.

Direct impacts including the final project footprint (construction and operation) are shown on Figure 8.

Table 23: Direct impacts to native vegetation

PCT ID	PCT Name		Vegetation Class		Vegetation Formation	Direct impact (ha)
835	Cumberland riverflat forest		Coastal Wetlands	Floodplain	Forested Wetlands	0.08
850	Cumberland shale hills woodland		Coastal Valley Woodlands	Grassy	Grassy Woodlands	0.37
-	Native vegetation	planted	-	-	-	0.80

Table 24: Direct impacts on threatened ecological communities

PCT ID	BC Act				EPBC Act		
	Listing status	Name		Direct impact (ha)	Listing status	Name	Direct impact (ha)
835	Endangered Ecological Community	River-Flat Forest	Eucalypt on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion	0.08	Critically Endangered	River- flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.	0.08
850	Critically Endangered Ecological Community	Cumberland Woodland	Plain in the Sydney Basin Bioregion	0.37	Critically Endangered	Cumberland Shale Woodlands and Shale-Gravel Transition Forest	0.37

Table 25: Direct impacts on threatened species and threatened species habitat

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	0.22 ha	Vulnerable	Vulnerable
<i>Litoria aurea</i>	Green and Golden Bell Frog	0.22 ha	Endangered	Vulnerable

Species	Common Name	Direct impact number of individuals / habitat (ha)	NSW listing status	EPBC Listing status
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	<i>Marsdenia viridiflora</i> R. Br. subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	0.14 ha	Endangered Population	Not Listed
<i>Myotis macropus</i>	Southern Myotis	0.22 ha	Vulnerable	Not Listed

4.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 26.

Table 26: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	835	Moderate_ poor	0.08	42.9	0	-42.9
2	850	Moderate_ poor	0.14	42.6	0	-42.6
3	850	Low – No Midstorey	0.23	52.1	0	-52.1

4.2.3 Indirect impacts

All impacts are considered to be confined to the boundaries of the development site. The indirect impacts of the development are outlined in Table 27.

Table 27: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
sedimentation and contaminated and/or nutrient rich run-off	Construction	Minimal due to the small area of disturbance	Downstream of the development site	During heavy rainfall or storm events	During rainfall events	Short term
transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed or pathogens	Minimal. Impacts will be contained within already disturbed locations	During vegetation removal	Occasionally during vegetation removal	Short term
trampling of threatened flora species	Construction / operation	No threatened flora present	N/A	N/A	N/A	N/A

rubbish dumping	Construction / operation	Left by contractors during works	Potential to cause localised rubbish dumping	During construction	Occasionally during vegetation removal	Short term
increase in predatory species populations	Construction / operation	Negligible likelihood of impact occurring as only a small degraded area of native vegetation present	N/A	N/A	N/A	N/A
increase in pest animal populations	Construction / operation	Negligible likelihood of impact occurring as only a small degraded area of native vegetation present	N/A	N/A	N/A	N/A

4.2.4 Prescribed biodiversity impacts

The development site has the prescribed biodiversity impacts as outlined in Table 28.

Table 28: Direct impacts on prescribed biodiversity impacts

Prescribed impact	biodiversity	Nature	Extent	Frequency	Duration	Timing
impacts of development on the habitat of threatened species or ecological communities associated with:		Removal of exotic vegetation which provides minor connectivity for threatened species	Confined to the development site	During construction works	Throughout the life of the project	Long term impacts
<ul style="list-style-type: none"> non-native vegetation 						

4.2.5 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 29.

Table 29: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
pre-clearance and avoidance to minimise the displacement of resident fauna	Minor	Minor	Pre-clearance survey of trees to be removed and identification / location of habitat trees by a suitably qualified ecologist. Supervision by a qualified ecologist(s) / licensed wildlife handler during tree removal in accordance with best practice methods.	Resident fauna relocated in a sensitive manner	Prior to and during clearing works	Project Manager / Ecologist
timing works to avoid critical life cycle events such as breeding or nursing	Moderate	Minor	If breeding threatened species are found during pre-clearance surveys, then avoid clearing works in later winter/spring during breeding/nesting period for birds. Where possible, avoid removing hollow bearing tree in bird and bat breeding periods.	Impacts to fauna during nesting/nursing avoided	During clearing works	Project Manager
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Moderate	Minor	Supervision by a qualified ecologist/licensed wildlife handler during tree removal in accordance with best practice methods. Larger hollow bearing trees should be felled by an arborist in one to two metre sections, beginning at the top of the crown, roping, sectioning and lowered the hollow sections to the ground for inspection by the ecologist.	Any fauna utilising habitat within the development site will be identified and managed to ensure clearing works minimise the likelihood of injuring resident fauna	Prior to and during clearing	Project Manager / Ecologist

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Moderate	Minor	Should any trees removed that have hollows/hollow trunks/ fissures, they should be retained as ground fauna habitat and/or used as replacement hollows and attached to trees within the within the development site. If it is impractical to use salvaged hollows as replacement tree hollows, compensatory nest boxes should be installed, as per the Vegetation Management Plan	Replacement of habitat features removed	Prior to and during clearing works	Project Manager / Ecologist
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	Moderate	Minor	During tree removal within the development site, any trees with the potential to fall or damage areas outside the development footprint should be removed using qualified arborists rather than heavy machinery.	Reduction of soil / vegetation disturbance outside of the development footprint	During clearing works	Project Manager
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Moderate	Negligible	Appropriate controls are to be utilised to manage exposed soil surfaces and stockpiles to prevent sediment discharge. Soil and erosion measures such as sediment fencing, clean water diversion must be in place prior to the commencement of the construction works and must be regularly inspected and maintained throughout the development of the site.	Erosion and sedimentation will be controlled. Reduction of any runoff into streams within the development footprint.	Prior to and during clearing works	Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
temporary fencing to protect significant environmental features such as riparian zones	Moderate	Negligible	Fencing around vegetation outside of the development footprint to prevent accidental impact/removal.	Reduce the likelihood of any accidental or indirect removal of vegetation, particularly vegetation listed as EEC/	Prior to and continuing through the duration of construction works	Project Manager
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Moderate	Minor	Vehicles, machinery and building refuse associated with the development construction should remain only within construction footprint areas, avoiding weed or pathogen related impacts to vegetation outside of the development site	Prevent spread of weeds or pathogens	For the duration of construction works	Project Manager
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	<p>All staff working on the development will undertake an environmental induction as part of their site familiarisation. This induction will include items such as:</p> <ul style="list-style-type: none"> • Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and weeds) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) • Key contacts in case of environmental emergency. 	All staff entering the study area are fully aware of the presence of native vegetation adjacent to the site and what to do in case of any environmental emergencies	To occur for all staff entering/working at the study area. Site briefings should be updated based on phase of the work and when environmental issues become apparent.	Project Manager
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native	Major	Moderate	As per the Vegetation Management Plan, existing areas of Cumberland shale hills woodland and Cumberland riverflat	The regeneration and enrichment of EECs within the study area	Following construction works	Project Manager / Qualified bush regenerators.

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
vegetation habitat on or adjacent to the development site			forest will be regenerated using enrichment plantings and weed control.			

4.2.6 Serious and Irreversible Impacts (SAII)

The development has candidate Serious and Irreversible Impacts (SAII) values as outlined in Table 30. Detailed consideration of whether impacts on candidate species are serious and irreversible is included in Table 31 and on TECs is included in Table 32.

Table 30: Candidate Serious and Irreversible Impact entities

Species / Community	Common Name	Principle	Direct impact individuals / area (ha)	Threshold
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Principle 3 and Principle 4	0 ha (no breeding habitat present)	Breeding habitat as identified by survey.
Cumberland Plain Woodland	Cumberland Plain Woodland	Principle 1 and Principle 2	0.14 ha with mid and ground strata present 0.23 ha with heavily modified mid and ground strata	N/A - Under development

Table 31: Determining whether impacts are serious and irreversible

Determining whether impacts are serious and irreversible	Assessment
Principle 1	
Does the proposal impact on a species, population or ecological community that is a candidate entity because it is in a rapid rate of decline?	<p><i>Chalinolobus dwyeri</i> - No</p> <p>Cumberland Plain Woodland – Yes; the proposal will impact 0.37 ha of <i>Cumberland Plain Woodland in the Sydney Basin Bioregion</i> which is listed as Critically Endangered under the BC Act.</p> <p>The proposal is not expected to impact on any other species or community considered to be in a rapid rate of decline.</p>
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible	The thresholds for Cumberland Plain Woodland in the Sydney Basin Bioregion have not been published yet according to the Threatened Biodiversity Data Collection provided in DPIE BioNet Atlas.
Principle 2	
Does the proposal impact on a species that is a candidate entity because it has been identified as having a very small population size?	<p><i>Chalinolobus dwyeri</i> - No</p> <p>Cumberland Plain Woodland – Yes; the proposal will impact 0.37 ha of <i>Cumberland Plain Woodland in the Sydney Basin Bioregion</i> which is listed as Critically Endangered under the BC Act.</p> <p>The proposal is not expected to impact on any other species or community considered as having a very small population size.</p>
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible	The thresholds for Cumberland Plain Woodland in the Sydney Basin Bioregion have not been published yet according to the Threatened Biodiversity Data Collection provided in DPIE BioNet Atlas.
Principle 3	

Determining whether impacts are serious and irreversible	Assessment
Does the proposal impact on the habitat of a species or an area of an ecological community that is a candidate entity because it has a very limited geographic distribution?	<i>Chalinolobus dwyeri</i> – Yes; <i>C. dwyeri</i> are considered to have a limited geographic distribution, however proposal will not impact upon potential or known breeding habitat, as the nearest rocky features are at least 600 metres to the south-southwest. Cumberland Plain Woodland - No
If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	N/A
Principle 4	
Does the proposal impact on a species, a component of species habitat or an ecological community that is a candidate entity because it is irreplaceable?	Cumberland Plain Woodland - No <i>Chalinolobus dwyeri</i> – Yes; <i>C. dwyeri</i> are considered to utilise habitats which are considered irreplaceable, however proposal will not impact upon potential or known breeding habitat, as the nearest rocky features are at least 600 metres to the south-southwest.
b. If yes, is the impact in excess of any threshold identified and therefore likely to be serious and irreversible? Note: where candidate entities have no listed threshold, any impact is considered likely to be serious and irreversible.	N/A

Table 32: Evaluation of an impact on a TEC – Cumberland Plain Woodland

Impact Assessment Provisions	Assessment																
a) evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)	Only 9 percent of the original extent remains intact, with the remnants scattered widely across the Cumberland Plain																
b) extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by: i. change in community structure ii. change in species composition	<p>The benchmark for PCT 850 composition and structure, and the data collected from the study area is below.</p> <p>Vegetation within the study area is considered to be highly degraded and is considered lacking in composition values such as shrub and ground layer richness. Considering the already highly modified nature of Cumberland Plain Woodland within the development site, it is unlikely that the minimal clearing proposed will cause a substantial change in the species composition or structure of the CEEC.</p> <table><tr><th></th><th>PCT 850 - Benchmark</th><th>PCT 850 – moderate - poor</th><th>PCT 850 – no-midstorey –</th></tr><tr><td>Tree Richness</td><td>5</td><td>3</td><td>4</td></tr><tr><td>Shrub Richness</td><td>8</td><td>2</td><td>3</td></tr><tr><td>Grass and Grass Like Richness</td><td>12</td><td>6</td><td>4</td></tr></table>		PCT 850 - Benchmark	PCT 850 – moderate - poor	PCT 850 – no-midstorey –	Tree Richness	5	3	4	Shrub Richness	8	2	3	Grass and Grass Like Richness	12	6	4
	PCT 850 - Benchmark	PCT 850 – moderate - poor	PCT 850 – no-midstorey –														
Tree Richness	5	3	4														
Shrub Richness	8	2	3														
Grass and Grass Like Richness	12	6	4														

Impact Assessment Provisions	Assessment			
	Forb Richness	14	4	3.5
	Fern Richness	2	0	0
	Other	5	2	1
	Total length of fallen logs (m)	40	7	0
	Litter Cover (%)	40	72	66.5
	Number of Large Trees	3	3	3

iii. disruption of ecological processes**iv. invasion and establishment of exotic species****v. degradation of habitat, and****vi. fragmentation of habitat**

iii) the disruption of ecological processes is expected to be minimal, due to the impact avoidance measures and the small amount of clearing which will be occurring because of the development.

iv) Areas of Cumberland Plain Woodland within the study area have a significant amount of weed invasion and are significantly modified from their original condition state with often only a canopy layer remaining and a weedy groundlayer present.

v) as detailed above, areas of Cumberland Plain Woodland within the study area are considered to be degraded and modified. The proposed development will increase the degradation of habitat due to the clearing of this community. However, as the clearing is considered to be of small scale, and the remediation measures proposed within the Vegetation Management Plan intend to increase the quality of remaining habitat – the development is not expected to cause a significant degradation of habitat.

vi) Cumberland Plain Woodland only occurs as fragmented and isolated patches throughout the landscape. The patches that occur within the development site do not form any connections to larger contiguous patches. The proposed development is unlikely to contribute to further fragmentation and isolation of Cumberland Plain Woodland.

Considering the already modified nature of the River-Flat Eucalypt Forest and Cumberland Plain Woodland within the Development site, it is unlikely that the minimal clearing proposed will substantially reduce the quality or integrity of the EEC within the area.

a. the impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal:

i. in hectares, and

ii. as a percentage of the current geographic extent of the TEC in NSW.

The development will impact 0.37 hectares out of the total 2.31 hectares of Cumberland Plain Woodland within the study area. Approximately 1.93 hectares will remain within the study area, of which 1.17 hectares will have an intact mid and ground stratum.

The current extent of the community within NSW is approximately 11200 ha. Therefore the clearing for the proposed development represents 0.0033% of the current extent.

b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:

There is approximately 1,366 hectares within 1,500 metres and 9,856 hectares of Cumberland Plain Woodland within 5,000 metres of the study area. It almost exclusively occurs as small remnant and degraded sites.

Impact Assessment Provisions	Assessment
<p>i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals</p> <p>ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:</p> <ul style="list-style-type: none"> distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and estimated maximum dispersal distance for native flora species characteristic of the TEC, and other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development <p>iii. describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Section 4.3). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.</p>	<p>Retained vegetation within the study area is not significantly fragmented by the proposed development (see Figure 3). The proposal is not expected to introduce a barrier for the flow of genetic material between remaining patches retained in the study area.</p> <p>Within patch recruitment will continue in the retained patches, and the proposed regeneration works, as per the Vegetation Management Plan is expected to increase the value of the remaining patches within the development site.</p> <p>The relative condition of the TEC has been described above in detail. The vegetation integrity scores reflect the modified nature of the TEC present. The scores were 52 and 42 for the two PCT 850 vegetation zones. The only components that were close to benchmark were tree species richness and number of large trees. This is likely to reflect the management history of the site as an operational golf course, preferring large native trees over a more complex and structurally diverse vegetation.</p>

4.3 Risk assessment

A risk assessment has been undertaken for any residual impacts likely to remain after the mitigation measures (Section 4.1.1) have been applied. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 33, Table 34 and Table 35 respectively, with the risk assessment provided in Table 36.

Table 33: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Likelihood criteria	Description
(Rare or practically impossible)	

Table 34: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 35: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 36: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
vegetation clearing	Construction/ operation	Medium	Medium
sedimentation and contaminated and/or nutrient rich run-off	Construction	High	Medium
noise, dust or light spill	Construction	Medium	Low
inadvertent impacts on adjacent habitat or vegetation	Construction	Low	Low

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
transport of weeds and pathogens from the site to adjacent vegetation	Construction	Low	Low
vehicle strike	Construction/ operation	Very Low	Very Low
trampling of threatened flora species	N/A	N/A	N/A
rubbish dumping	Operation	Low	Low
wood collection	Operation	Very Low	Very Low
bush rock removal and disturbance	Construction/ operation	Very Low	Very Low
increase in predatory species populations	Construction/ operation	Low	Low
increase in pest animal populations	Construction/ operation	Low	Low
increased risk of fire	Construction/ operation	Low	Low
disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	N/A	N/A	N/A
sedimentation and contaminated and/or nutrient rich run-off	Construction	Low	Low



Figure 7: Final project footprint

4.4 Impact summary

Following implementation of BAM and use of BAMC, the following impacts have been determined.

4.4.1 Serious and Irreversible Impacts (SII)

As discussed in Section 4.2.6, there are no thresholds for a SII on Cumberland Plain Woodland. The principles outlined in clause 6.7 of the BC Reg have been applied and further assessment consistent with ss 9.1.1 of BAM 2020 have been applied and are described above.

There are no impacts to potential breeding habitat for the Large-eared Pied Bat occurs within the development site. Therefore, a SII would not operate on the Large-eared Pied Bat.

4.4.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 37 and shown on Figure 8. The impacts of the development requiring offset for threatened species and threatened species habitat are outlined in Table 38 and on Figure 8.

Table 37: Impacts to native vegetation that require offsets

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
850	Cumberland shale hills woodland	Coastal Valley Grassy Woodlands	Grassy Woodlands	0.37
835	Cumberland riverflat forest	Coastal Floodplain Wetlands	Forested Wetlands	0.08

Table 38: Impacts on threatened species and threatened species habitat that require offsets

Species	Common Name	Direct impact / habitat (ha)	NSW listing status	EPBC Listing status
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	0.22 ha	Vulnerable	Vulnerable
<i>Litoria aurea</i>	Green and Golden Bell Frog	0.22 ha	Endangered	Vulnerable
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	<i>Marsdenia viridiflora</i> R. Br. subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	0.14 ha	Endangered Population	Not Listed
<i>Myotis macropus</i>	Southern Myotis	0.22 ha	Vulnerable	Not Listed

4.4.3 Impacts not requiring offsets

The impacts of the development not requiring offset for native vegetation are shown on Figure 9. Impacts not requiring offset includes the 0.80 ha of planted native vegetation which has been assessed under the planted native vegetation streamlined assessment module. Impacts not requiring offset are shown in Figure 8.

4.4.4 Areas not requiring assessment

Areas not requiring assessment within the development site include those identified as mown exotic grassland and other exotic flora. Areas not requiring assessment are shown in Figure 10.

4.4.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 39. The number of species credits required for the development are outlined in Table 40. A biodiversity credit report is included in Appendix D:.

Table 39: Ecosystem credits required

PCT ID	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
835	Cumberland riverflat forest	Forested Wetlands	0.08	3
850	Cumberland shale hills woodland	Grassy Woodlands	0.37	11

Table 40: Species credit summary

Species	Common Name	Direct impact / habitat (ha)	Credits required
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	0.22 ha	7
<i>Litoria aurea</i>	Green and Golden Bell Frog	0.22 ha	5
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	<i>Marsdenia viridiflora</i> R. Br. subsp. <i>viridiflora</i> population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	0.14 ha	3
<i>Myotis macropus</i>	Southern Myotis	0.22 ha	5

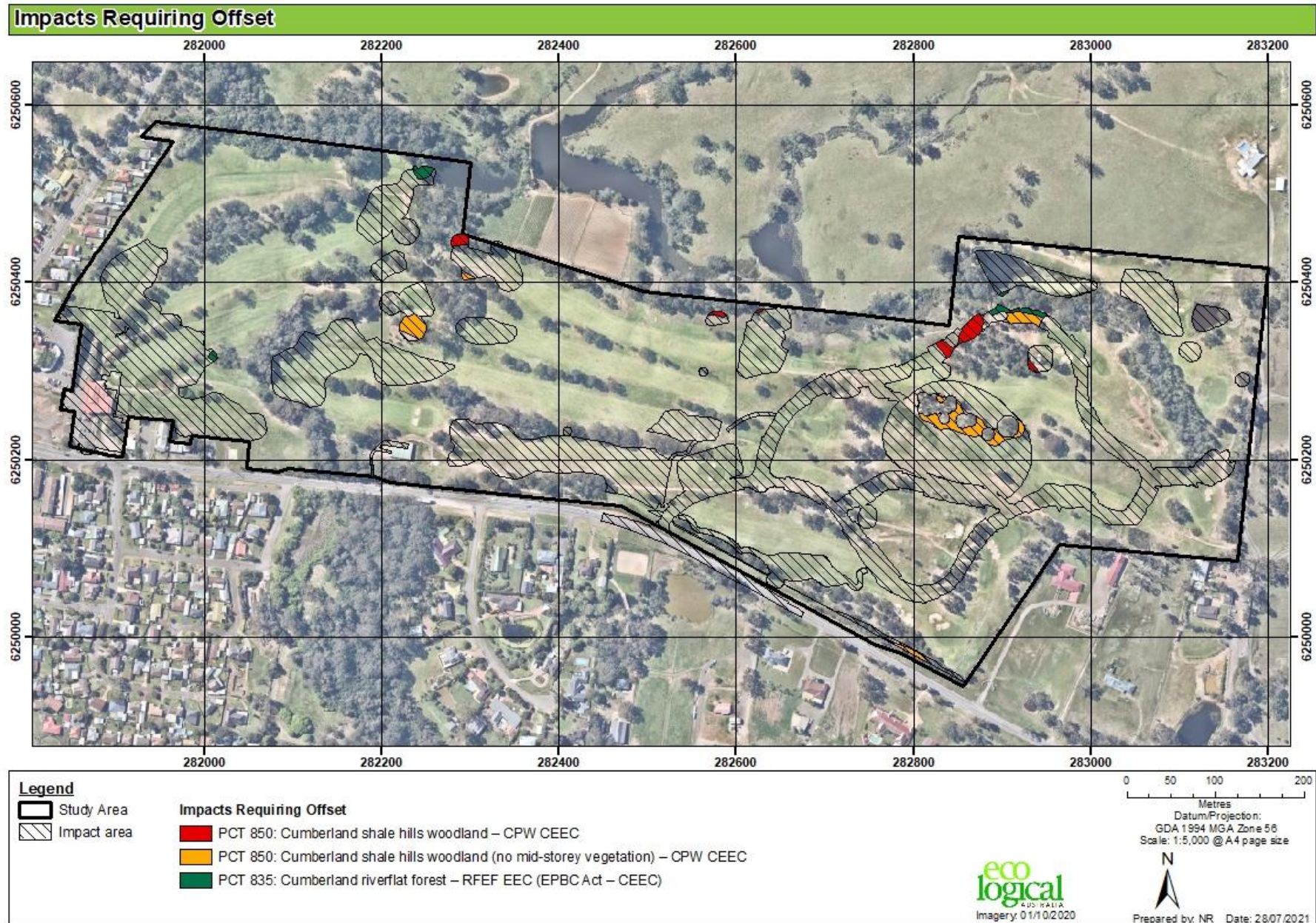


Figure 8: Impacts requiring offset



Figure 9: Areas not requiring offset



Figure 10: Areas not requiring assessment

4.5 Consistency with legislation and policy

Additional matters relating to impacts on flora and fauna which are not covered by the BC Act must also be addressed for the proposed development. Potential MNES in accordance with the EPBC Act have been addressed below.

4.5.1 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

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 matter of MNES” is defined as a “controlled action”, and requires approval from the Commonwealth Department of Agriculture, Water and the Environment (DAWE), which is responsible for administering the EPBC Act.

The process includes conducting an Assessment of Significance for listed threatened species and ecological communities that represent a matter of MNES that will be impacted as a result of the proposed action. Significant impact guidelines (formerly Department of Environment and Energy (DotEE) 2014) that outline a number of criteria have been developed by the Commonwealth, to provide assistance in conducting the Assessment of Significance and help decide whether or not a referral to the Commonwealth is required.

A habitat assessment was undertaken and the following MNES were assessed consistent with the Significant Impact Guidelines 1.1:

Vulnerable Species

- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Litoria aurea* (Green and Golden Bell Frog).

Critically Endangered Ecological Communities

- *Cumberland Plain Woodland in the Sydney Basin Bioregion*
- *River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria.*

4.5.2 Vulnerable Species

Pteropus poliocephalus (Grey-headed Flying-fox)

There are no known Grey-headed Flying Fox camps within the study area, with the nearest camp at Emu Plains (237), 16 km north of the study area (DAWE 2020b). In 2019 the camp recorded 500-2,499 individuals (DAWE 2020b).

Grey-headed Flying-fox present in camps within a 20 km radius of the site may use the foraging resources available within the development site. The potential foraging habitat within the development site is marginal would not be relied upon as a sole foraging resource for this species. The Grey-headed Flying-fox will use a range of resources within 20 km of their camps. Therefore, the resources available in the development site form part of a mosaic of resources within the locality.

Considering that Grey-headed Flying-fox is likely to forage within the development site on an occasional basis, a significance assessment has been undertaken in accordance with Significant impact guidelines 1.1 under the EPBC Act (Table 41) (DotEE, 2013).

Chalinolobus dwyeri (Large-eared Pied Bat)

There are no suitable breeding resources i.e. caves present within the development site. It is considered that this species may forage within the development site on an occasional basis, and therefore a significance assessment has been undertaken in accordance with Significant impact guidelines 1.1 under the EPBC Act (Table 41) (DotEE, 2013).

Litoria aurea (Green and Golden Bell Frog)

This species inhabits marshes, dams and stream-sides, particularly those containing *Typha* spp. (bullrushes) or *Eleocharis* spp. (spikerushes). The Green and Golden Bell Frog may utilise the dams and surrounding native vegetation on occasion as part of a larger home foraging range, and therefore a significance assessment has been undertaken in accordance with Significant impact guidelines 1.1 under the EPBC Act (Table 41) (DotEE, 2013).

Table 41: EPBC Act Assessment for Vulnerable species

Criterion	Assessment
Criterion a: lead to a long-term decrease in the size of an important population of a species	<p>The Matters of National Environmental Significance Impact Guidelines 1.1 (Commonwealth of Australia, 2013) defines an important population as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:</p> <ul style="list-style-type: none"> - Key source populations either for breeding or dispersal - Populations that are necessary for maintaining genetic diversity, and/or - Populations that are near the limit of the species range <p>The Grey-headed Flying-fox is considered one population due to the constant exchange of genetic material between individuals and its movement between camps throughout its entire geographic range. Maternity or other roosting habitat is considered important habitat for this species. No Grey-headed Flying-fox camps currently occur within the development site with the nearest active Grey-headed Flying-fox camp approximately 16 km to the north.</p> <p>Within NSW, based on available records, the largest concentration of populations appears to be in the sandstone escarpments of the Sydney basin and northwest slopes of NSW with these forming important population centres (DERM 2011). The Large-eared Pied Bat recorded on the development site is considered to form part of this important population due to the constant exchange of genetic material between individuals and movement throughout its entire geographic range. This species roosts mainly in caves (near their entrances) and crevices in cliffs. No roosting/breeding habitat occurs within the development site with the nearest potential caves/cliff habitat approximately 600m to the south and west.</p> <p>The Green and Golden Bell Frog Significant impact guidelines state that 'due to the restricted nature of all known populations in New South Wales and the uncertainty about the current status of the Victorian populations, all current populations of green and golden bell frog are regarded as an 'important population'. A current population is defined as a site where one or more green and golden bell frogs have been detected on at least one occasion since 1995, even if they have not recently been discovered at the site (DEWH& A 2009)'. One individual has been recorded in 2019 approximately 4 km to the east of the development site, therefore it is considered that the habitat on site, including dams and surrounding native vegetation may form part of a larger home foraging range for an important population of the Green and Golden Bell Frog.</p> <p>The proposed action will directly remove 0.08 ha of River Flat Eucalypt Forest, 0.0.14 ha of Cumberland Plain Woodland in moderate-low condition and 0.0.23 ha of low condition (no midstorey) which comprises suitable foraging habitat for the Grey-headed Flying-fox, Large-eared Pied Bat and Green and Golden Bell Frog. It is unlikely that this provides any suitable breeding habitat for these three species. Given the proximity of more suitable habitat outside the assessment area, the removal of this potential foraging habitat would not lead to the long-term decrease in the size of an important population of these species.</p>
Criterion b: reduce the area of occupancy of an important population	<p>The proposed development will reduce the extent of available potential foraging habitat for these three species. About 0.45 ha of potential foraging habitat will be removed from the development site. The vegetation within the development site may provide supplementary foraging habitat for the Grey-headed Flying-fox and Large-eared Pied Bat. The development site does not contain breeding or sheltering habitat (i.e. bat camps/roost sites). Both of these species are known to fly long distances and as such they are likely to utilise a large extent of habitat which may include some habitat within the development site and a large amount of habitat in adjacent lands. Due to the extent of habitat outside the development site, the removal of a small amount of native and non-native vegetation is unlikely to significantly reduce the extent of occupancy for these two</p>

Criterion	Assessment
	species. The Green and Golden Bell frog may utilise habitat in the form of dams and foraging habitat to be cleared, however, it is likely that this forms part of a larger home foraging range and will not significantly reduce the extent of occupancy for this species.
Criterion c: fragment an existing important population into two or more populations	The proposed action will remove 0.45 ha of vegetation, some of which is likely to provide marginal foraging habitat for the Grey-headed Flying-fox, Large-eared Pied Bat and Green and Golden Bell Frog. The removal of this vegetation will not significantly fragment vegetation corridors that may be used by these three species. The two bat species are highly mobile, and the Green and Golden Bell Frog is relatively mobile throughout large home ranges therefore the proposed action will not fragment an existing important population into two or more populations. While the potential foraging habitat may contribute as a 'stepping stone' for these highly mobile species to other more substantial foraging habitat sites, this function is unlikely to be significantly inhibited by the proposed works. Furthermore, the Grey-headed Flying-fox has been recorded in urban environments and are likely to continue to forage adjacent to the development site and across the broader locality.
Criterion d: adversely affect habitat critical to the survival of a species	<p>For the Grey-headed Flying-fox, foraging habitat within a 50-kilometre radius of a roost site with greater than 30,000 individuals is foraging habitat critical to the survival of this species. The study area is approximately 16 km south of the closest camp at Emu Plains which has 500-2,499 individuals as recorded in 2019. Therefore, foraging habitat at the study area is not consistent with habitat that would be critical to the survival of this species.</p> <p>For the large-eared pied bat Sandstone cliffs and fertile wooded valley habitat within close proximity of each other are considered habitat critical to the survival of this species (DERM 2011).</p> <p>There is no critical habitat listed for the Green and Golden Bell Frog. The site is considered unlikely to contain habitat critical to the survival of the species. A minimal amount of potential foraging habitat, in the form of dams and disturbed vegetation is present. No camps/roost sites will be affected by the proposed action. Given that these three species are relatively mobile, it is considered unlikely that the works would adversely affect habitat critical to the survival of this species.</p>
Criterion e: disrupt the breeding cycle of an important population	The proposed action will not disrupt the breeding cycle of the Grey-headed Flying-fox or Large-eared Pied Bat given that no camps or breeding caves will be affected by the proposed action and suitable foraging habitat is available adjacent to the development site. It is also not considered that the vegetation for removal provides breeding habitat for the Green and Golden Bell Frog in the locality.
Criterion f: Adversely affect habitat critical to the survival of a species; modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The potential foraging habitat to be removed is marginal and of low quality. Given the small amount of potential foraging habitat to be removed, that potential foraging habitat will persist adjacent to the development site and across the locality, and that these species are generally mobile throughout their home ranges, it is unlikely that the habitat to be removed would cause the species to decline.
Criterion g: Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The proposed action is unlikely to result in the establishment of an invasive species that is harmful to these three species.
Criterion h: Introduce disease that may cause the species to decline	Grey-headed Flying-foxes are reservoirs for the Australian bat lyssavirus (ABL) and can cause clinical disease and mortality in Grey-headed Flying-foxes (DECCW 2009). The proposed action is unlikely to present a significant ecological stress on any camps or on

Criterion	Assessment
	<p>individuals that may utilise the development site and therefore the works are unlikely to introduce or exacerbate this virus or any other disease that may cause this species to decline.</p> <p>Frog Chytrid Fungus has been identified as a threatening process for the Green and Golden Bell Frog. The proposed action is unlikely to introduce or exacerbate this fungus or any other disease that may cause this species to decline.</p>
Criterion i: Interfere substantially with the recovery of the species	Considering the above factors, the proposed works will not interfere substantially with the recovery of these species.
Conclusion	In consideration of the above, the proposed works are considered unlikely to have a significant impact on the Grey-headed Flying-fox, Large-eared Pied Bat or Green and Golden Bell Frog

4.5.3 Critically Endangered Ecological Community

Cumberland Plain Woodland in the Sydney Basin Bioregion

This CEEC occurs on soils derived from Wianamatta Shale, and throughout the driest part of the Sydney Basin. Before European settlement, was extensive across the Cumberland Plain, western Sydney. Today, only 9 percent of the original extent remains intact, with the remnants scattered widely across the Cumberland Plain. The dominant canopy trees of Cumberland Plain Woodland are Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*E. tereticornis*), with Narrow-leaved Ironbark (*E. crebra*), Spotted Gum (*Corymbia maculata*) and Thin-leaved Stringybark (*E. eugenioides*) occurring less frequently. The shrub layer is dominated by Blackthorn (*Bursaria spinosa*), and it is common to find abundant grasses such as Kangaroo Grass (*Themeda australis*) and Weeping Meadow Grass (*Microlaena stipoides* var. *stipoides*).

River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria

This CEEC is found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis* (Forest Red Gum), *E. amplifolia* (Cabbage Gum), *Angophora floribunda* (Rough-barked Apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (bangalay) and *E. elata* (river peppermint) may be common south from Sydney, *E. ovata* (Swamp Gum) occurs on the far south coast, *E. saligna* (Sydney Blue Gum) and *E. grandis* (Flooded Gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain.

A layer of small trees may be present, including *Melaleuca decora*, *M. styphelioides* (Prickly-leaved Teatree), *Backhousia myrtifolia* (Grey Myrtle), *Melia azedarach* (White Cedar), *Casuarina cunninghamiana* (River Oak) and *C. glauca* (Swamp Oak).

Table 42: EPBC Act Assessment for CEEC

Criterion	Assessment
Criterion a: reduce the extent of an ecological community	A total of 0.08 ha of River-Flat Eucalypt Forest CEEC will be directly impacted. 0.14 ha of Cumberland Plains Woodland CEEC in moderate-low condition and 0.23 ha of low condition (no midstorey) will be affected.
Criterion b: fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	Both Riverflat Eucalypt Forest and Cumberland Plain Woodland within the project footprint exist as small, degraded patches. The areas proposed for removal will not result in fragmentation. Connectivity will be maintained outside the proposed action's footprint.
Criterion c: adversely affect habitat critical to the survival of an ecological community	The River-Flat Eucalypt Forest and Cumberland Plain Woodland within the project site has undergone significant past disturbance for construction of the gold course and generally occur as scattered trees with an exotic grassy understorey and little to no shrub cover. Given the vegetation proposed for removal is comprised of scattered trees with a predominantly exotic understorey, it is unlikely that the small area of River-Flat Eucalypt Forest or Cumberland Plain Woodland to be removed would represent an area of habitat that is critical to the survival of these communities within the locality.
Criterion d: modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	Considering the limited amount of soil and water disturbance likely to occur as part of the clearing proposed for both the River-Flat Eucalypt Forest and Cumberland Plain Woodland, it is not considered that modification to abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival will be affected.
Criterion e: cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	<p>The River-Flat Eucalypt Forest is heavily impacted by weed invasion, particularly by privet and Camphor laurel, which often form dense stands. The Cumberland Plain Woodland within the development site forms small remnants with some areas comprising canopy only, and a highly modified groundlayer and no shrub layer. Some areas comprise a canopy layer with a sparse shrub layer and modified weedy groundlayer.</p> <p>Considering the already highly modified nature of the River-Flat Eucalypt Forest and Cumberland Plain Woodland within the development site, it is unlikely that the minimal clearing proposed will cause a substantial change in the species composition for these two communities.</p>
Criterion f: cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: <ul style="list-style-type: none"> – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community 	<p>As discussed above in Criterion e, both the River-Flat Eucalypt Forest and Cumberland Plain Woodland have a significant amount of weed invasion and are significantly modified from their original condition state with often only a canopy layer remaining and a weedy groundlayer present.</p> <p>Considering the already modified nature of the River-Flat Eucalypt Forest and Cumberland Plain Woodland within the Development site, it is unlikely that the minimal clearing proposed will substantially reduce the quality or integrity of the occurrence of these two communities to a level beyond their current state.</p>
Criterion g: interfere with the recovery of an ecological community.	The proposed action is unlikely to interfere with the recovery of these two ecological communities due to the already highly modified nature of vegetation present and the minimal amount of clearing proposed.

Criterion	Assessment
Conclusion	In consideration of the above, the proposed works are considered unlikely to have a significant impact on either Riverflat Eucalypt Forest or Cumberland Plain Woodland.

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Travers Biodiversity and Ecology (2017) Flora & Fauna Assessment. Proposed Cemetery, Lot 2 DP 1108408 13 Park Road, Wallacia. October 2017 (REF: A17162)

Travers Biodiversity and Ecology (2019a) Biodiversity Development Assessment Report. Proposed Cemetery Lot 2 DP 1108408 13 Park Road, Wallacia December 2019 (REF: 18CMCT02)

Travers Biodiversity and Ecology (2019b) Tree Assessment, Proposed 9 Hole Golf Course and Cemetery. Lot 2 DP 1108408, Lot 512 DP 1079728. 13 Park Road, Wallacia December 2019 REF: (18CMCT02T)

Travers Biodiversity and Ecology (2019c) Vegetation Management Plan. Proposed Wallacia Country Club Golf Course & Proposed Cemetery Lot 2 DP 1108408 13 Park Road, Wallacia

Appendix A: Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the development site. In cases where multiple populations occur in the development site or a population occupies part of the development site, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height < 5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs

Appendix B: Vegetation plot data

Composition (number of species)																													
Structure (total cover)															Function														
Plot	Pct	Condition Class	Zone	Easting	Northing	Bearing	Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Large trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree Stem 5 – 9 cm	Tree Stem 10 – 19 cm	Tree Stem 20 – 29 cm	Tree Stem 30 – 49 cm	Tree Stem 50 - 79 cm	Tree Regen	High Threat Exotic
G1	835		56	282093.9	6250478	68	4	0	5	3	0	1	43	0	0.8	0.3	0	0.1	4	2	78	42	1	1	1	1	1	1	41.2
G2		PLANTED	56	281976.6	6250431	219	5	0	3	2	0	1	22.0	0.0	51.1	0.2	0.0	0.1	1	0	19	0	0	0	1	1	1	0	11.7
G3	850	NO MIDSTOR EY	56	282289.4	6250373	220	4	3	4	2	0	0	37	15	20.3	0.2	0	0	5	3	65	0	0	1	1	1	1	0	4.5
G4	850	NO MIDSTOR EY	56	282525.3	6250385	101	4	3	4	5	0	2	48.0	46.1	37.1	1.8	0.0	0.2	1	0	68	0	1	1	1	1	1	1	54.1
G5		PLANTED	56	282745.5	6250173	334	3	0	3	3	0	1	35.0	0.0	7.2	0.3	0.0	0.1	2	0	7.8	0	0	0	1	1	1	0	10.1
G6		PLANTED	56	283121.4	6250213	340	2	0	4	6	0	2	30.0	0.0	3.4	10.7	0.0	0.2	0	0	85	0	1	1	1	1	0	1	2.4
G7	850	MOD_PO OR	56	282870.2	6250331	95	3	2	6	4	0	2	26.0	7.0	8.5	0.4	0.0	0.2	3	0	72	7	1	1	1	1	1	1	71.6

Appendix C: EPBC Act Likelihood of Occurrence

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the Protected Matters Search Tool. 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
- ‘no’ = habitat within the study area and in the vicinity is unsuitable for the species.

A test of significance was conducted for threatened species or ecological communities that were recorded within the study area 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 study area intermittently for foraging. For these fauna species, the habitat present and likely to be impacted 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 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 Data Collection.

Table 43: Likelihood of occurrence for threatened entities

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
ECOLOGICAL COMMUNITIES						
<i>Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion</i>	-	E	Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion. Dominated by <i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> , <i>Angophora bakeri</i> and <i>Eucalyptus sclerophylla</i> . A small tree stratum of <i>Melaleuca decora</i> is sometimes present, generally in areas with poorer drainage. It has a well-developed shrub stratum consisting of sclerophyllous species such as <i>Banksia spinulosa</i> var. <i>spinulosa</i> , <i>Melaleuca nodosa</i> , <i>Hakea sericea</i> and <i>Hakea dactyloides</i> (multi-stemmed form). The ground stratum consists of a diverse range of forbs including <i>Themeda australis</i> , <i>Entolasia stricta</i> , <i>Cyathochaeta diandra</i> , <i>Dianella revoluta</i> subsp. <i>revoluta</i> , <i>Stylidium graminifolium</i> , <i>Platysace ericoides</i> , <i>Laxmannia gracilis</i> and <i>Aristida warburgii</i> .	No – this ecological community was not identified within the development site.	N/A	No
<i>Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community</i>	-	E	The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. It has a dense to sparse tree layer in which <i>Casuarina glauca</i> (swamp oak) is the dominant species northwards from Bermagui. Other trees including <i>Acmena smithii</i> (Lilly Pilly), <i>Glochidion</i> spp. (Cheese Trees) and <i>Melaleuca</i> spp. (Paperbarks) may be present as subordinate species and are found most frequently in stands of the community northwards from Gosford. <i>Melaleuca ericifolia</i> is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines, <i>Parsonsia straminea</i> , <i>Geitonoplesium cymosum</i> and <i>Stephania japonica</i> var. <i>discolor</i> , a sparse cover of shrubs, and a continuous groundcover of forbs,	No – this ecological community was not identified within the development site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			sedges, grasses and leaf litter. The composition of the ground stratum varies depending on levels of salinity in the groundwater.			
<i>Cooks River / - Castlereagh Ironbark Forest</i>		CE	Associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. The structure of the community may vary from tall open forests (>40m) to woodlands. The most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>Eucalyptus amplifolia</i> (Cabbage Gum), <i>Angophora floribunda</i> (Rough-barked Apple) and <i>Angophora subvelutina</i> (Broad-leaved Apple). <i>Eucalyptus baueriana</i> (Blue box), <i>Eucalyptus botryoides</i> (Bangalay) and <i>Eucalyptus elata</i> (River Peppermint) may be common south from Sydney. <i>Eucalyptus ovata</i> (Swamp Gum) occurs on the far south coast, <i>Eucalyptus saligna</i> (Sydney Blue Gum) and <i>Eucalyptus grandis</i> (Flooded Gum) may occur north of Sydney, while <i>Eucalyptus benthamii</i> is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including <i>Melaleuca decora</i> , <i>M. styphelioides</i> (prickly-leaved teatree), <i>Backhousia myrtifolia</i> (grey myrtle), <i>Melia azadarach</i> (white cedar), <i>Casuarina cunninghamiana</i> (river oak) and <i>Casuarina glauca</i> (swamp oak). Scattered shrubs include <i>Bursaria spinosa</i> , <i>Solanum prinophyllum</i> , <i>Rubus parvifolius</i> , <i>Breynia oblongifolia</i> , <i>Ozothamnus diosmifolius</i> , <i>Hymenanthera dentata</i> , <i>Acacia floribunda</i> and <i>Phyllanthus gunnii</i> . The groundcover is composed of abundant forbs, scramblers and grasses.	No – this ecological community was not identified within the development site.	N/A	No
<i>Cumberland Plain Woodland in the Sydney Basin Bioregion</i>		CE	This CEEC occurs on soils derived from Wianamatta Shale, and throughout the driest part of the Sydney Basin. Before European settlement, was extensive across the Cumberland Plain, western Sydney. Today, only 9 percent of the original extent remains intact, with the remnants scattered widely across the Cumberland Plain. The dominant canopy trees of Cumberland Plain Woodland are Grey Box (<i>Eucalyptus moluccana</i>) and Forest Red Gum (<i>E. tereticornis</i>), with Narrow-leaved Ironbark (<i>E. crebra</i>), Spotted Gum	Yes – this ecological community was identified within the development site.	Yes	Yes

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			(<i>Corymbia maculata</i>) and Thin-leaved Stringybark (<i>E. eugenioides</i>) occurring less frequently. The shrub layer is dominated by Blackthorn (<i>Bursaria spinosa</i>), and it is common to find abundant grasses such as Kangaroo Grass (<i>Themeda australis</i>) and Weeping Meadow Grass (<i>Microlaena stipoides</i> var. <i>stipoides</i>).			
<i>Elderslie Banksia Scrub Forest in the Sydney Basin Bioregion</i>		CE	This EEC is restricted to the Cumberland subregion of the Sydney Basin IBRA bioregion. It is only known from the Camden local government area (LGA) in proximity to the Nepean River. The ecological community occurs at low elevations, of around 60 to 100 m above sea level. It is normally above the 100 year flood level, though it is possible that some regrowth on mined sand deposits is now artificially within the present floodplain. It is found in an area that receives around 750 mm rainfall annually. The ecological community occurs on deep sandy substrates on high-level Tertiary alluvium. Key elements of the canopy include <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> (Coast Banksia), <i>Angophora subvelutina</i> (Broad-leaved Apple), <i>Eucalyptus botryoides</i> x <i>E. saligna</i> (a natural hybrid of Bangalay and Sydney Blue Gum) and various other species of Eucalyptus over a mostly shrubby understorey	No – this ecological community was not identified within the development site.	No	No
<i>River-flat eucalypt forest on coastal floodplains of southern NSW and eastern Victoria</i>	-	CE	This CEEC is found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>E. amplifolia</i> (Cabbage Gum), <i>Angophora floribunda</i> (Rough-barked Apple) and <i>A. subvelutina</i> (broad-leaved apple). <i>Eucalyptus baueriana</i> (blue box), <i>E. botryoides</i> (bangalay) and <i>E. elata</i> (river peppermint) may be common south from Sydney, <i>E. ovata</i> (Swamp Gum) occurs on the far south coast, <i>E. saligna</i> (Sydney Blue Gum)	Yes – this ecological community was identified within the development site.	Yes	Yes

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			<p>and <i>E. grandis</i> (Flooded Gum) may occur north of Sydney, while <i>E. benthamii</i> is restricted to the Hawkesbury floodplain.</p> <p>A layer of small trees may be present, including <i>Melaleuca decora</i>, <i>M. styphelioides</i> (Prickly-leaved Teatree), <i>Backhousia myrtifolia</i> (Grey Myrtle), <i>Melia azaderach</i> (White Cedar), <i>Casuarina cunninghamiana</i> (River Oak) and <i>C. glauca</i> (Swamp Oak).</p>			
<i>Shale Sandstone Transition Forest of the Sydney Basin Bioregion</i>			Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas. The main tree species include <i>Eucalyptus tereticornis</i> (Forest Red Gum), <i>E. punctata</i> (Grey Gum), stringybarks (<i>E. globoidea</i> , <i>E. eugenioides</i>) and ironbarks (<i>E. fibrosa</i> and <i>E. crebra</i>). Areas of low sandstone influence (more clay-loam soil texture) have an understorey that is closer to Cumberland Plain Woodland.	No – this ecological community was not identified within the development site.	N/A	No
<i>Turpentine-Ironbark Forest of the Sydney Basin Bioregion</i>	-	CE	<p>Restricted to areas with clay soil derived from Wianamatta Shale in an area that generally has an annual rainfall of more than 950 mm. A medium-height open forest with a lower tree layer, an open low shrub layer and a prominent ground layer. Western outliers of the community in wetter habitats may have a tall open forest structure. On the lowlands, the canopy is dominated by <i>Syncarpia glomulifera</i> (Turpentine), with <i>Eucalyptus paniculata</i> (Grey Ironbark) and <i>E. eugenioides</i> (Thin-leaved Stringybark) occurring less frequently. On the margin of the Cumberland Plain, the vegetation is dominated by <i>Eucalyptus punctata</i> (Grey Gum) and <i>Syncarpia glomulifera</i>, with species such as <i>Corymbia gummifera</i> (Red Bloodwood) and <i>Eucalyptus globoidea</i> (White Stringybark) occurring sporadically. The westernmost occurrences of the community are dominated by species such as <i>Syncarpia glomulifera</i>, <i>Eucalyptus globoidea</i>, <i>Eucalyptus cypellocarpa</i> (Monkey Gum), <i>E. notabilis</i> (Mountain Mahogany) and <i>E. paniculata</i> (Grey Ironbark) in southern areas.</p>	No – this ecological community was not identified within the development site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			<i>Eucalyptus punctata</i> (Grey Gum) and/or <i>E. piperita</i> (Sydney Peppermint) are common in areas with sandstone influence.			
<i>Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion</i>		E	This EEC is generally a tall open eucalypt forests found on igneous rock (predominately Tertiary basalt and microsyenite) in, or adjacent to, the Sydney Basin Bioregion. The ecological community occurs in areas of high rainfall, generally ranging from 950 to 1600 mm/year. Dominant canopy species are most often <i>Eucalyptus fastigata</i> (brown barrel), <i>E. viminalis</i> (ribbon gum) and <i>E. radiata</i> subsp. <i>radiata</i> (narrow-leaved peppermint). <i>Eucalyptus obliqua</i> (messmate stringybark), <i>E. elata</i> (river peppermint), <i>E. quadrangulata</i> (white-topped box) and <i>E. smithii</i> (ironbark peppermint) are also common components. <i>Eucalyptus oreades</i> (Blue Mountains ash) and <i>E. blaxlandii</i> (Blaxland's stringybark) are prevalent in the Blue Mountains forms, particularly on the rocky edges of basalt. <i>Eucalyptus cypellocarpa</i> (mountain grey gum) is widespread in drier sites throughout the range of the ecological community, while <i>E. piperita</i> (Sydney peppermint) may also occur. <i>Eucalyptus ovata</i> (swamp gum) may be present in areas of impeded drainage or high groundwater.	No – this ecological community was not identified within the development site.	N/A	No
<i>Western Sydney - Dry Rainforest and Moist Woodland on Shale</i>		CE	Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion. Dominated by <i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> , <i>Angophora bakeri</i> and <i>Eucalyptus sclerophylla</i> . A small tree stratum of <i>Melaleuca decora</i> is sometimes present, generally in areas with poorer drainage. It has a well-developed shrub stratum consisting of sclerophyllous species such as <i>Banksia spinulosa</i> var. <i>spinulosa</i> , <i>Melaleuca nodosa</i> , <i>Hakea sericea</i> and <i>Hakea dactyloides</i> (multi-stemmed form). The ground stratum consists of a diverse range of grasses and forbs including <i>Themeda australis</i> , <i>Entolasia stricta</i> , <i>Cyathochaeta diandra</i> , <i>Dianella revoluta</i> subsp.	No – this ecological community was not identified within the development site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
<i>revoluta</i> , <i>Stylidium graminifolium</i> , <i>Platysace ericoides</i> , <i>Laxmannia gracilis</i> and <i>Aristida warburgii</i> .						
FAUNA						
<i>Actitis hypoleucos</i>	Common Sandpiper	M	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Anthochaera phrygia</i>	Regent Honeyeater	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 <i>Casuarina cunninghamiana</i> (River Oak).	Potential - occasional seasonal foraging habitat features associated with this species were identified within the development site. The development site is not within an important breeding area for the species.	Yes (minor foraging only)	No – the species is highly mobile and preferable foraging habitat is available within the broader locality.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly <i>Typha</i> spp. (Bullrushes) and <i>Eleocharis</i> spp. (Spikerushes).	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions. Shallow fresh or brackish wetlands, with	Unlikely - suitable habitat not identified within	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			inundated or emergent sedges, grass, saltmarsh or other low vegetation.	the development site.		
<i>Calidris ferruginea</i>	Curlew Sandpiper	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.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Calidris melanotos</i>	Pectoral Sandpiper	M	Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Suitable foraging habitat for this species is present. No breeding habitat occurs.	Yes (minor foraging only)	Yes
<i>Cuculus optatus</i>	Oriental Cuckoo	M	Nonbreeding habitat: monsoonal rainforest, vine thickets, wet sclerophyll forest or open Casuarina, Acacia or Eucalyptus woodland.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Dasyurus maculatus maculatus</i>	Spotted-tailed Quoll	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Unlikely – suitable habitat, in the form of maternal den site, were not identified within the development site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site or indirectly impacted	Impact Assessment Required
<i>Falco hypoleucos</i>	Grey Falcon	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Gallinago hardwickii</i>	Latham's Snipe	M	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Grantiella picta</i>	Painted Honeyeater	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.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Hirundapus caudacutus</i>	White-throated Needletail	V, 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 - suitable habitat not identified within the development site.	N/A	No
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	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.	Unlikely - suitable habitat not identified within	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				the development site.		
<i>Lathamus discolor</i>	Swift Parrot	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	Potential – foraging habitat features associated with this species were identified within the development site.	Yes (minor foraging only)	No – the species is highly mobile and more foraging habitat is available within the broader locality.
<i>Limosa lapponica</i>	Bar-tailed Godwit	M	Summer migrant to Australia. Widespread along the coast of NSW, including the offshore islands. Also numerous scattered inland records. Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing <i>Typha</i> spp. (bullrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.	Potential – foraging and minimal breeding habitat features associated with this species were identified within the development site.	Yes (minor foraging only)	Yes
<i>Mixophyes balbus</i>	Stuttering Frog	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.	Unlikely - suitable habitat not identified within the development site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
<i>Monarcha melanopsis</i>	Black-faced Monarch	M	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Unlikely - habitat present is substantially degraded such that this species is unlikely to utilise the development site for foraging or breeding.	N/A	No
<i>Monarcha trivirgatus</i>	Spectacled Monarch	M	Usually considered a denizen of the dense rainforests and moist eucalypt forests of eastern and north-eastern Australia, the Spectacled Monarch sometimes also inhabits mangroves and other densely vegetated habitats	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Motacilla flava</i>	Yellow Wagtail	M	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on the western plains. Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Numenius madagascariensis</i>	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.	Unlikely - suitable habitat not identified within the development site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site or indirectly impacted	Impact Assessment Required
<i>Pandion cristatus</i>	Eastern Osprey	M	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.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Petauroides volans</i>	Greater Glider	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.	Unlikely - habitat present is substantially degraded such that this species is unlikely to utilise the development site for foraging or breeding.	N/A	No
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	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.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Phascolarctos cinereus</i>	Koala	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District, and at several sites on the southern tablelands. Eucalypt woodlands and forests.	Unlikely - Habitat present is substantially degraded such that this species is unlikely to utilise the development site for foraging or breeding.	N/A	No
<i>Pommerhelix duralensis</i>	Dural Land Snail	E	The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and northwest fringes of the	Unlikely - Habitat present is	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			Cumberland IBRA subregion on shale-sandstone transitional landscapes. The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris.	substantially degraded such that this species is unlikely to utilise the development site.		
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Likely – seasonal foraging habitat available within the study area. No camps identified within study area.	Yes (foraging only)	Yes
<i>Rhipidura rufifrons</i>	Rufous Fantail	M	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Rostratula australis</i>	Australian Painted Snipe	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.	Unlikely - suitable habitat not identified within the development site.	N/A	No
<i>Tringa nebularia</i>	Common Greenshank	M	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range. Terrestrial wetlands and sheltered coastal habitats.	Unlikely - suitable habitat not identified within	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				the development site.		
FLORA						
<i>Acacia bynoeana</i>	Bynoe's Wattle	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Acacia pubescens</i>	Downy Wattle	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Allocasuarina glareicola</i>	-	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 <i>Eucalyptus parramattensis</i> , <i>Eucalyptus fibrosa</i> , <i>Angophora bakeri</i> , <i>Eucalyptus sclerophylla</i> and <i>Melaleuca decora</i> .	Unlikely - the presence of this species was not identified, and suitable habitat was not identified	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				within the development site. Site is too degraded for presence of this species.		
<i>Cynanchum elegans</i>	White-flowered Wax Plant	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 - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Darwinia biflora</i>	-	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas, in an area bounded by Maroota, North Ryde, Cowan and Kellyville. Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Eucalyptus aggregate</i>	Black Gum	V	In NSW, found in the Central and Southern Tablelands, in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. Alluvial soils, on cold, poorly-drained flats and	Unlikely - the presence of this species was not identified, and the	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			hollows adjacent to creeks and small rivers. Usually occurs in open woodland with a grassy groundlayer.	development site is not within the species' distribution.		
<i>Eucalyptus benthamii</i>	Camden White Gum	V	<p>Alluvial flats of the Nepean River and its tributaries. Mainly Kedumba Valley of the Blue Mountains National Park and Bents Basin State Recreation Area. Also along the Nepean River around Camden and Cobbitty, at Werriberri (Monkey) Creek in The Oaks, and on the Nattai River in Nattai National Park.</p> <p>Occurs in open forest. Requires a combination of deep alluvial sands and a flooding regime.</p>	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site.	N/A	No
<i>Genoplesium baueri</i>	Bauer's Orchid	Midge 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.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flowered Grevillea	V	<p>Sporadically distributed throughout the Sydney Basin and in the Hunter in the Cessnock - Kurri Kurri area. Also known from Putty to Wyong and Lake Macquarie on the Central Coast.</p> <p>Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.</p>	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				Site is too degraded for presence of this species.		
<i>Haloragis exaltata</i> subsp. <i>exaltata</i>		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.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Melaleuca deanei</i>	Deane's Paperbark	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Heath on sandstone.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Micromyrtus minutiflora</i>	-	V	Restricted to the general area between Richmond and Penrith, western Sydney. Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments.	Unlikely - the presence of this species was not identified, and the development site is not within the	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				species' distribution.		
<i>Persicaria elatior</i>	Tall Knotweed	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 - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Persoonia acerosa</i>	Needle Geebung	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 - the presence of this species was not identified, and the development site is not within the species' distribution.	N/A	No
<i>Persoonia hirsuta</i>	Hairy Geebung	E	Scattered distribution around Sydney, from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				for presence of this species.		
<i>Persoonia nutans</i>	Nodding Geebung	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 Ironbark Forest) on aeolian and alluvial sediments. Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Pimelea curviflora</i> var. <i>curviflora</i>	-	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Pimelea spicata</i>	Spiked flower	Rice- 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. <i>Eucalyptus moluccana</i> (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				development site. Site is too degraded for presence of this species.		
<i>Pomaderris brunnea</i>	Rufous Pomaderris	V	In NSW, found around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands. Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Pterostylis saxicola</i>	Sydney Plains Greenhood	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Two populations occur within a conservation reserve (Georges River National Park; Scheyville National Park). Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils. All species of <i>Pterostylis</i> are deciduous and die back to fleshy, rounded underground tuberoids. The time of emergence and withering has not been recorded for this species, however flowering occurs from October to December and may vary due to climatic conditions.	Unlikely - The presence of this species was not identified (conspicuous species). The development site is not within the currently known locations and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
				the development site.		
<i>Pultenaea glabra</i>	Smooth Bush-pea	V	Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas. Swamp margins, hillslopes, gullies and creekbanks, within dry sclerophyll forest and tall damp heath on sandstone.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Furthermore, the site is on the fringe of the predicted distribution. Site is too degraded for presence of this species.	N/A	No
<i>Pultenaea parviflora</i>	-	V	Endemic to the Cumberland Plain. Mainly from Windsor to Penrith and east to Dean Park, with outlier populations at Kemps Creek and Wilberforce. Dry sclerophyll forest, especially Castlereagh Ironbark Forest, Shale Gravel Transition Forest and transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Unlikely - the presence of this species was not identified, and suitable habitat was not identified within the development site. Site is too degraded for presence of this species.	N/A	No
<i>Rhizanthella slateri</i>	Eastern Underground Orchid	E	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's	Unlikely - The presence of this species was not	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
			Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed. Flowers September to November.	identified (conspicuous species). The development site is not within the currently known locations and it was determined that the habitat is substantially degraded such that this species is unlikely to utilise the development site.		
<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m above sea level in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	Unlikely – not identified during targeted survey for this species.	N/A	No
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Subtropical and littoral rainforest on gravels, sands, silts and clays.	Unlikely - the presence of this species was not identified, and the development site is not within the species' distribution.	N/A	No

Scientific Name	Common Name	EPBC Act Status	Distribution and Habitat	Likelihood of occurrence on site	Habitat on site directly or indirectly impacted	Impact Assessment Required
<i>Thelymitra kangaloonica</i>	Kangaloon Orchid	Sun 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.	Unlikely - the presence of this species was not identified, and the development site is not within the species' distribution.	N/A	No
<i>Thesium australe</i>	Austral Toadflax	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 - suitable habitat not identified within the development site.	N/A	No

Appendix D: Biodiversity Credit Report



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023160/BAAS17001/20/00023161	Nepean Gardens	10/06/2021
Assessor Name	Assessor Number	BAM Data version *
Meredith Henderson	BAAS17001	45
Proponent Names	Report Created	BAM Case Status
	29/07/2021	Finalised
Assessment Revision	Assessment Type	Date Finalised
0	Part 4 Developments (General)	29/07/2021

BOS entry trigger

BOS Threshold: Biodiversity Values Map and area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Cumberland Plain Woodland in the Sydney Basin Bioregion	Critically Endangered Ecological Community	850-Cumberland shale hills woodland
Species		
Chalinolobus dwyeri / Large-eared Pied Bat		

Assessment Id	Proposal Name
00023160/BAAS17001/20/00023161	Nepean Gardens

Page 1 of 5



BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

Botaurus poiciloptilus / Australasian Bittern

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
835-Cumberland riverflat forest	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	2	0	2
850-Cumberland shale hills woodland	Cumberland Plain Woodland in the Sydney Basin Bioregion	0.4	7	4	11

835-Cumberland riverflat forest

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
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Assessment Id

00023160/BAAS17001/20/00023161

Proposal Name

Nepean Gardens

Page 2 of 5



BAM Biodiversity Credit Report (Like for like)

	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 686, 828, 835, 941, 1108, 1109, 1212, 1228, 1293, 1318, 1326, 1386, 1504, 1556, 1594, 1618, 1720, 1794	-	835_Mod_poor	Yes	2	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
850-Cumberland shale hills woodland	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	850_Low_no_m id	Yes	7	Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Assessment Id

00023160/BAAS17001/20/00023161

Proposal Name

Nepean Gardens

Page 3 of 5



BAM Biodiversity Credit Report (Like for like)

	Cumberland Plain Woodland in the Sydney Basin Bioregion This includes PCT's: 849, 850	-	850_Mod_poor	No	4 Cumberland, Burragorang, Pittwater, Sydney Cataract, Wollemi and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	835_Mod_poor, 850_Mod_poor	0.2	7.00
Litoria aurea / Green and Golden Bell Frog	835_Mod_poor, 850_Mod_poor	0.2	5.00
Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	850_Mod_poor	0.1	3.00
Myotis macropus / Southern Myotis	835_Mod_poor, 850_Mod_poor	0.2	5.00

Credit Retirement Options

Like-for-like credit retirement options

Chalinolobus dwyeri / Large-eared Pied Bat	Spp	IBRA subregion
	Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW

Assessment Id
00023160/BAAS17001/20/00023161

Proposal Name
Nepean Gardens

Page 4 of 5



BAM Biodiversity Credit Report (Like for like)

Litoria aurea / Green and Golden Bell Frog	Spp	IBRA subregion
	Litoria aurea / Green and Golden Bell Frog	Any in NSW
Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Spp	IBRA subregion
	Marsdenia viridiflora subsp. viridiflora - endangered population / Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW

Assessment Id

00023160/BAAS17001/20/00023161

Proposal Name

Nepean Gardens

Page 5 of 5

