Department of Planning and Environment

Biodiversity Development Assessment Report, The Sixteenth Pty Ltd, Residential Development, Murray Downs Drive, Murray Downs, New South Wales.

Prepared by Alison Martin, Greenloaning Biostudies - BAAS 18002

Final Report December 2023

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Document control

Version	Date	Author	Details
1	29/12/2023	A. Martin	Final issued with development application
2	XX/XX/202X	A. Martin	Amended in response to Council comments

Summary

Proposed Development

The proposed development entails subdivision of Lot 2/DP 1002063 (4.6 hectares) into residential lots, ranging from 410 square metres to 2,281 square metres in size. Works would also be required for associated roads and other residential infrastructure such as stormwater management, drainage works and Asset Protection Zones (APZ). A best practice stormwater management system will be installed and managed.

The development site is located within a predominantly cleared landscape and formed part of the original Murray Downs Station. The project represents a planned component of a strategic plan to encourage growth of the Murray Downs urban area, focussed around the Murray Downs golf course and the Murray Downs Golf & Country Club.

The site was entirely cleared until the late 1980's/early 1990's, when it was replanted with tree species predominantly native to South Australia and Western Australia, with some stands of NSW species. The current condition of the site is highly disturbed with substantial areas of bare ground and vehicle tracks.

The development requires consent under Part 4 of the EP&A Act.

Biodiversity Offset Scheme Entry

Entry into the BOS was triggered by the extent of clearing of native vegetation potentially exceeding the clearing threshold, with the State Vegetation Type Mapping showing the site to support native vegetation communities. Although the majority of the site and proposed clearing comprises planted vegetation not typically occurring in NSW, there were areas of potential natural regeneration and planted native species, and from a precautionary perspective, the preparation of a BDAR, under the Streamlined Assessment Module-Planted Vegetation, Appendix D under the BAM 2020, was considered an appropriate process..

Measures to Avoid and Minimise Impacts

The project design requires clearing of the site vegetation in general, but total clearing along the southern boundary will be avoided, with some trees to be retained to provide some movement corridor along the edge of the adjacent water body. Other trees will be retained where possible, particularly in open space areas, depending on Council's conditions for the development

Plant Community Types and Threatened Ecological Communities

The only Plant Community Type (PCT) occurring on the development site and representing a PCT occurring within the subregion is PCT 10 - *River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).* This community occurs as a small pocket of vegetation in the lower topography in the South-western corner of the site. PC is not a Threatened Ecological Community (TEC).

The majority of vegetation on the site is dominated by combinations of the planted tree species the mallee, Salt River Gum (*Eucalyptus sargentii*) (SA) and Flat-topped Yate (*E. occidentalis*) (WA). Here is also one sector along the South-eastern boundary supporting planted Swamp Oak (*Casuarina glauca*) (Coastal NSW).

There is one TEC, a disturbed, regenerating form of PCT 19 - *Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains* occurring immediately adjacent to the site along the roadside of Murray Downs Drive.

Threatened Species

No threatened species of flora or fauna were recorded on the development site, but two species, the Koala (*Phascolarctos cinereus*) and the Southern Myotis (*Myotis Macropus)* have been assumed to be present.

Impacts

Direct impacts arising from the proposed development comprise:

- Removal of up to 0.21 ha of PCT 10, although some vegetation may be able to be retained along the boundary;
- Removal of the majority of vegetation over the remainder of the site, with some tree retention proposed at least along the southern boundary; and[
- Removal of potential fauna habitat associated with the existing vegetation, including 0.21 ha of potential Koala and Southern Myotis habitat associated with PCT 10.

The total impact area is 4.46 ha, which also encompasses existing tracks, bare ground and predominantly exotic ground cover with scattered patches of native shrubs.

Potential indirect and prescribed impacts comprise:

- Pollution of adjacent/nearby waterbodies;
- Physical harm to fauna using the site habitats during clearing;
- Increased fragmentation of habitats
- Increased potential for weed invasion into the adjacent TEC;
- Increased risk of vehicle strikes on wildlife

Mitigation Measures

Key proposed mitigation measures comprise:

- Preparation and implementation of a best practice Stormwater Management Plan;
- Pre-clearing surveys and clearing supervision according to best practice protocols;
- Design, installation and maintenance of vehicle speed restriction measures, including signage;
- Retention of some trees wherever possible, particularly along the southern boundary; and
- Preparation of a Vegetation Management Plan to direct planting and maintenance of landscaping with plant species native to the area and tree retention areas.

Final Offset Requirements

The final offset requirements for the project are summarised in Table E1 and Table E2 below.

Table E1 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits required
1	10	No	0.21	2

Table E2 Impacts that require an offset – species credits

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
Koala	*Phascolarctos cinereus*	0.21	3
Southern Myotis	*Myotis macropus*	0.21	3

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Shortened forms

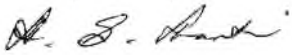
APZ	asset protection zone
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
CEEC	critically endangered ecological community
DBH	diameter at breast height over bark
EC	ecological community listed under the EPBC Act
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EEC	endangered ecological community
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia

LLS Act	*Local Land Services Act 2013* (NSW)
MNES	matters of national environmental significance
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
PCT	plant community type
SAII	serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
SWMP	*Stormwater Management Plan*
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
VEC	vulnerable ecological community
Vegetation SEPP	*State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* (NSW)
VMP	*Vegetation Management Plan*

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Signature: 

Date: 29th December 2023

BAM Assessor Accreditation no: _BAAS 18002

This BDAR has been prepared to meet the requirements of BAM 2020. Appendix A provides an assessment of compliance with the minimum information requirements outlined in BAM Appendix K.

ii. Details and experience of author/s and contributors

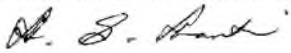
Authors and contributors

Name	BAM Assessor Accreditation no. (if relevant)	Position/Role	Tasks performed	Relevant qualifications
Alison Martin	18002	Principal Ecologist and Author	Project management Field surveys BAM-C data entry and analysis Data entry Report preparation Research Document review	B Sc., M Env Law
Bob Bennett		Senior Researcher/ GIS Officer	GIS Mapping Figure preparation Report preparation	B. Nat Resources (Hons)
Sarah Odgers		Assistant Ecologist	Data collation Assistance with report preparation	B. Environmental Sc.

iii. Conflict of interest

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature: 

Date: _29th December 2023_____

BAM Assessor Accreditation no: BAAS 18002_____

Stage 1: Biodiversity assessment[1]

1. Introduction

1.1 Proposed development

1.1.1 Development overview

The development would subdivide Lot 2/DP 1002063 (4.6 hectares) into residential lots with areas ranging from 410 square metres to 2,281 square metres. Works would also be required for associated roads and other residential infrastructure such as stormwater management, drainage works and Asset Protection Zones (APZ). A best practice stormwater management system will be installed and managed as described in Section 1.1.3.

The development requires consent under Part 4 of the EP&A Act.

1.1.2 Location

The subject property is located on Murray Downs Drive, Murray Downs, NSW, 3585. The land is comprised of Lot 2/DP 1002063 (Figure 1 – Site Map, & Figure 2 – Location Map).

1.1.3 Proposed development and the subject land

The proposed development is a residential subdivision that would include:

- Subdivision of Lot 2/DP 1002063 (4.6 hectares) into 46 new lots with areas ranging from 410 square metres to 2,281 square metres. At this stage, Lot 38 is proposed for open space.
- Additional works for associated roads and other residential infrastructure such as stormwater management (described below), drainage works and Asset Protection Zones (APZs).
- Installation of temporary infrastructure during the construction phase of the proposed development, including facilities for earthmoving and soil erosion control, temporary roads, park up areas, stockpiles, waste or storage zones, and temporary buildings and fences.

The storm water management plan (SWMP) to be prepared for the development will include the conveyance of stormwater runoff from the development site to the proposed nominated point of discharge, being the existing purpose-built irrigation storage located immediately south of the site within the Murray Downs golf course. The (SWMP) will also adopt water sensitive urban design principles in accordance with the Urban Stormwater: Best Practice Environmental Management Guidelines.

The SWMP will generally include;

- Stormwater from roof catchments that will be directed to stormwater tanks for reuse onsite for toilet flushing and/ or garden irrigation purposes.
- On ground /surface runoff from the residential hardstand areas and road reserve will be captured via a proposed underground drainage system within the road network

[1] Although this report has been prepared using the BDAR report template, much of the background to the BDAR, including plot data, was prepared prior to the releases of the template. Consequently, not all components of this BDAR completely follow the template.

that will be directed via a gross pollutant trap located on the southern boundary of the site into the existing purpose-built irrigation storage located within the Murray Downs golf course, where the stormwater will be harvested and reused for irrigation across the golf course (information provided by R. Heil, Heil Engineering Consultants).

The development layout is shown in Figure 3, and the site boundary clearly shown on Figure 1 and Figure 3. Although the proposed development site currently supports planted native vegetation, and it would be desirable to retain some of the mature trees, for the purposes of this BDAR it has been assumed that all of Lot 2 will be cleared. Therefore, it also is assumed that the whole of Lot 2 represents the construction and operational footprint, covering an area of 4.6ha.

The subject land is located approximately 560 metres North-east of the Murray River. It constitutes a fairly level parcel of land with a gentle slope to the South-west. There are no distinctive drainage lines on the property, although there is a man-made waterbody immediately to the south of the subject land on the adjoining golf course property. The entire landscape encompassing the subject land has been substantially modified, in the past, the subject land and environs originally forming part of Murray Downs Station, established in 1839. The land was cleared of the majority of native vegetation cover in the early 1940s, to enhance sheep grazing opportunities. Historic sheep grazing also tended to remove native understory species. The area is shown as entirely cleared for agriculture in the 1960s, in the historical aerial image provided in Figure 4.

The landform itself also was substantially altered for residential development in the late 1980's/early 1990s, with the natural variations in topography smoothed from higher ground to the North-east of the development site, through the site and environs downslope to near the Murray River. The extent of disturbance in the area is evident on the aerial mage provided in Figure 5.

The original indigenous overstory vegetation in the local vicinity of the site consisted predominantly of the Cypress Pine woodland of source-bordering dunes (Plant Community Type 19). The subject land was replanted in 1989/1990 with a range of mallee and other dryland species from Victoria, South Australia, Western Australia and coastal NSW. Close examination of Figure 7 shows the general lack of vegetation on the subject land and the rows in the substrate presumably for the purposes of replanting. There are no mature tree species related to the original Plant Community Type (Cypress Pine Woodland) planted or present on the site. However, there is some recolonisation of understorey species (e.g. Ruby Saltbush) occurring, and components of the original Cypress Pine Woodland have regenerated along the roadside and to the north of the development site.

The planted trees species are not native to the area and comprise primarily the mallee, Salt River Gum (*Eucalyptus sargentii*) (SA), Flat-topped Yate (*E. occidentalis*) (WA) and Swamp Oak (*Casuarina glauca*) (Coastal NSW). There are various species of saltbush present on the property. A small sector of the development site supports a few specimens of native tree species, comprising River Red Gum (*E. camaldulensis*) and Black Box (*E. largiflorens*) and marginally representative of the *River Red Gum - Black Box woodland wetland* (PCT 10).

Given this extent of surface disturbance over the development site and environs, the soil layers occurring on the subject land could be expected to vary to some degree from the descriptions provided in the following paragraph. In general, however, the surface soils on the development site were observed to be sandy loams.

Mapped soils for the site comprise brown soils with a layer of sandy loam to light clay loam overlying a clay subsoil. The surface loam may vary in thickness from 10 to 50 cm. The deeper subsoils usually have a crumbly and coarser texture compared with the overlying, uppermost part of the subsoil. These soils are not suited to cultivation and are prone to structural decline, if regularly cultivated (DPI, 2022).

The uppermost geological unit beneath the proposed subdivision area is part of the Shepparton Formation (AES, 2022). This Shepparton Formation contains unconsolidated to poorly consolidated mottled variegated clay, silty clay with lenses of polymictic, coarse to fine sand and gravel; partly modified by pedogenesis, includes intercalated red-brown paleosols. This geological unit is around 30 metre thick and has been accumulating since the Pliocene (5.333 million to 2.58 million years ago) (Geoscience Australia, 2022).

The unit underlying the Shepparton Formation is the marine Parilla Sands (AES, 2022). The Parilla Sands have a maximum thickness of approximately 15 metres and comprise sands, and fine to medium-grained, unfossiliferous, non-marine, clayey, quartz-rich; sandy clays, combined with aeolian, lacustrine and fluvial deposits (Geoscience Australia, 2022).

1.1.4 Other documentation

Refer to section 1.1.3 and Figures 4 and 5.

1.2 Biodiversity Offsets Scheme entry

Entry into the BOS was triggered by the extent of clearing of native vegetation potentially exceeding the clearing threshold, with the State Vegetation Type Mapping also suggested the site supported native vegetation communities. Although the majority of the proposed clearing comprises planted vegetation not typically occurring in NSW, there were areas of potential natural regeneration and planted native species, and from a precautionary perspective, the preparation of a BDAR, under the Streamlined Assessment Module-Planted Vegetation, Appendix d under the BAM 2020, was considered appropriate. Compliance with the BDAR requirements for the Streamlined Module-Planted Vegetation is provided in Appendix A. General Photographs of the site are provided in Appendix B.

1.3 Excluded impacts

No excluded impacts relevant to the subject land have been identified.

1.4 Matters of national environmental significance

The Protected Matters Search Tool was used to investigate Matters of National Environmental Significance (MNES) potentially occurring on the site (refer to Appendix C). No MNES requiring a referral under the EPBC Act have been identified as relevant to the subject land.

1.5 Information sources

Key information sources used in this BDAR, comprise the following:

- Advanced Environmental Systems (AES). 2022. Aboriginal and European Cultural Heritage, Sixteenth Estate, Murray Downs Drive, Murray Downs, NSW
- *Biodiversity Assessment Method Order* 2020 (NSW)
- BioNet TBDC (NSW Department of Planning and Environment 2023a)
- BioNet Atlas (NSW Department of Planning and Environment 2023b)
- BioNet Vegetation Information System (NSW Department of Planning and Environment 2023c)
- Department of Climate Change, Energy, the Environment and Water 2023. ‘EPBC Act Protected Matters Search Tool.
- National Herbarium of NSW 2023 PlantNET NSW.

- Mitchell, P. B, 2002. Descriptions for NSW (Mitchell) Landscapes Version 2, 2002. Department of Environment and Climate Change, Sydney.
- Plans, details on the project and historical imagery from the proponent.

Spatial data sources comprise:

- Department of Planning and Environment (DPE), 2022. Biodiversity Values Map and Threshold Tool. https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap floristics-vis-1108541b3 Accessed 02 November 2022.
- NSW Government Spatial Services, 2022. Spatial Collaboration Portal. https://www.spatial.nsw.gov.au/news/nsw_spatial_collaboration_portal Accessed November 2022.
- Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, 2022. http://goto.arcgisonline.com/maps/World_Imagery Accessed November 2022.
- Department of Environment and Energy, 2022. Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions) https://datasets.seed.nsw.gov.au/dataset/interim-biogeographic-regionalisation-for-australia-ibra-version-7-regions Accessed November 2022.
- Geoscience Australia. 2022. Australian Stratigraphic Units Database. https://asud.ga.gov.au/search-stratigraphic-units/results/25474 Accessed 01 November 2022.
- Department of Primary Industries (DPI), 2022. SOILpak f or vegetable growers. https://www.dpi.nsw.gov.au/agriculture/horticulture/vegetables/sil-management/soilpak Accessed 01 November 2022.
- Department of Planning and Environment (DPE), 2022. NSW State Vegetation Type Map: Version C1.1.M1. https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map Accessed October 2022.
- Department of Planning and Environment (DPE), 2022. BioNet Atlas: Species Sighting Search. https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx?who=f4ebfc74-1571-4969-b64a-8c30e2b5ac30 Accessed 11 October 2022.
- Department of Environment, Land, Water & Planning (DELWP), 2022. NVIM — Biodiversity Information: Native Vegetation, 2005 Ecological Vegetation. https://nvim.delwp.vic.gov.au/Map?_ga=2.246436740.1219924123.1668039861-1671035631.1668039861 Accessed 10 November 2022.
- Department of Regional NSW, 2022. NSW Seamless Geology. https://data.nsw.gov.au/data/dataset/0e598ae6-f566-4036-aa61-3f1a1f73ade9 Accessed 11 November 2022.

2. Methods

2.1 Site context methods

2.1.1 Landscape features

Given the small size of the development site within a highly modified landscape, an assessment of the landscape context was limited to viewing the surrounds from the road access and the site, plus reviewing historical and current aerial imagery. Detailed survey data collection was limited to the development site per se, and included sampling 4 BA, as shown on Figure 6 and described in Section 2.1.2, 2.2.3 and 2 2 4.

2.1.2 Native vegetation cover

The recent imagery used for desktop assessment was produced by ESRI *et al* (2022) and was accessed in November 2022. A scale of 1:1,600 was used to produce the native vegetation map (Figure 7). This scale allowed for practical, accurate mapping across the whole of the subject land.

The SVTM (DPE, 2022x) provided the basis for identifying the boundaries of PCTs within the subject land, at a desktop level. Field assessment (4 BAM Plots, general site observations and detailed observation points along the roadside) was used to investigate the validity of the SVTM mapping.

2.2 Native vegetation, threatened ecological communities and vegetation integrity methods

2.2.1 Existing information

Descriptions of the PCTs and TECs as mapped for the area under the NSW State Vegetation Type Map (Version C1.1.M1) (DPEx, 2022), were reviewed and subsequently compared with the vegetation identified on the development site. Information on the vegetation on the site also was obtained from the landowner, who has a long history with the subject lands and who provided historical imagery of the site (refer to Figure 4 and Figure 5), and ecological consultant Peter Clinton.

2.2.2 Mapping native vegetation extent

The recently completed NSW State Vegetation Type Map (Version C1.1.M1) (DPEx, 2022), was accessed in October 2022, to determine the extent and percentage of native vegetation within the assessment area, outside the subject land.

As the assessment area covers parts of NSW and Victoria, it was also necessary to access vegetation cover data from the Victorian Department of Environment, Land, Water & Planning (DELWP) (2022), Native Vegetation Information Map — Biodiversity Information: Native Vegetation, 2005 Ecological Vegetation. This data was digitised to determine area and native vegetation cover in the Victorian section of the assessment area.

Although the tree cover on the development site comprises predominantly planted trees not native to NSW, there is some regeneration of native trees in the Southwest sector, some regeneration of some understorey species, as well as the occurrence in the eastern sector of planted trees native to NSW but not native to the subject land locality. This complex of vegetation therefore was included in the mapping of native vegetation extent as shown on Figure 7.

Field checks and detailed photographs were undertaken by the landowner to ensure that the community supporting White Cypress Pine (*Casuarina* glauca) only occurred outside the property boundary and would not require any clearing.

2.2.3 Plot-based vegetation survey

In order to confirm the PCT types within the subject land, 4 20 x 50 m floristic plots were sampled in accordance with the directions contained in the BAM 2020. In addition, notes on vegetation species present and photographs of species and communities were taken at a number of locations, covering the extent of the subject land.

2.2.4 Vegetation integrity survey

The development site is only 4.6 ha and reviewing the variation in both vegetation communities and condition was relatively straightforward. The BAM plots to determine vegetation integrity were selected on the basis of any changes in dominant species observed to be present and the condition of the understorey and extent of exotic species present.

2.3 Threatened flora survey methods

2.3.1 Review of existing information

Existing information reviewed for the purposes of this BDAR, including anything relevant to habitat constraints and microhabitats for threatened species is documented in Section 1.5 of this BDAR.

2.3.2 Habitat constraints assessment

Standard procedures were undertaken to assess habitat constraints and microhabitats for threatened species within the subject land, including:

- Documentation within 4 BAM plots of the extent of native plant species' occurrence representing any potential habitat for threatened flora species;
- Observations on the existing human uses of the development site and associated disturbances affecting any potential habitat for threatened flora species;
- Observations on the extent of any weed infestations; and
- General observations of vegetation community condition, in conjunction with site photographs.

2.3.3 Field surveys

Although only a very small section of the development site supports replanted/regenerated native vegetation that represents a naturally occurring PCT (PCT 10) for the subregion, from a precautionary perspective, all threatened flora species recorded for the subregion were considered for the potential for occurrence. Species considered to have a small potential for occurrence, based on the general habitats present comprised those listed below:

- *Sclerolaena napiformis* (Turnip Copperburr)
- *Swainsona murrayana* (Slender Darling Pea)
- *Austrostipa metatoris* (A spear-grass)

None of these species, however, were subsequently found to be associated with the site vegetation. From a precautionary perspective, and considering the development site is only

4.6 ha, most of which is very open, the best approach to survey for any unexpected threatened species was determined to comprise:

- Detailed species plot data collection from 20 x 20 m within 4 BAM plots 20 x 50 m, as described in Section 2.2.3; and
- Undertaking a number of transects over the site as a whole, with any additional species documented or collected for subsequent identification.

Field survey locations are shown on Figure 6.

2.4 Threatened fauna survey methods

2.4.1 Review of existing information

Existing information reviewed for the purposes of this BDAR, including anything relevant to habitat constraints and microhabitats for threatened species is documented in Section 1.5 of this BDAR. Of key relevance to the assessment process was the understanding that the entire area had been cleared and subject to replanting and the requirements of Section D2, Appendix D of the BAM 2020 was therefore applied to the site survey process.

2.4.2 Habitat constraints assessment

As per Section D2, Appendix D of the BAM 2020, viz;

> *The assessor must assess the suitability of the planted native vegetation for use by threatened species and record any incidental sightings or evidence (e.g. scats, stick nests) of threatened species credit species (flora and fauna) using, inhabiting or being part of the planted native vegetation.*

standard procedures were undertaken to assess habitat constraints and microhabitats for threatened species within the subject land, including:

- Documentation of any hollow development in trees within the 4 BAM plots sampled and across the site in general;
- Consideration of the occurrence of any Koala food trees;
- Observations on the occurrence of any raptor nests;
- Observations on the existing human uses of the development site associated disturbances; and
- Observations on the extent of any weed infestations.

2.4.3 Field surveys

Given the small size of the development site as a whole, the very small size of the only representation of a naturally occurring PCT and the highly modified and disturbed nature of the site, field survey procedures were restricted to the following:

- Checks for any occurrences of tree hollows and size of hollows;
- Observations on the potential occurrence of any large nests (raptors); and
- Documentation of any Koala food trees.

Field survey locations are shown on Figure 6.

2.5 Weather conditions

Weather conditions during the survey were moderate, as indicated by Table 1 below.

Table 1 Environmental conditions during threatened species surveys

Survey undertaken (e.g. method / targeted species)	**Date**	**Time**	**Temperature** (min. & max.)	**Wind** (light, mod…)	**Rainfall** (mm)	**Other conditions relevant to the species**
Habitat assessments, hollow and nest site surveys	17/09/2022	10 am - 5 pm	5.9-16.9°C	Light-moderate	NIL	N/A

2.6 Limitations

The main limitation to the surveys conducted on the development site are as follows:

- Only one day was spent on the site, primarily owing to the following factors:
  - Small size of the site;
  - History of the site as a cleared area now supporting planted vegetation; and
  - Disturbed nature of the site from a combination of previous clearing, introduction of planted and other exotic vegetation, impacts from feral pests and ongoing human disturbance.
- Owing to only one site survey, no seasonal variations in species occurrence could be considered, and the timing of the survey was outside the stipulated timeframe for surveys for the Southern Myotis;
- The limited requirement for survey and assessment, as per Appendix D of the BAM 2020, based on the majority of the planted vegetation not representing any naturally occurring PCT; and
- Extended timeframes for determining the final layout and other project matters and subsequent project financial constraints precluding further site surveys. .

Limitations were addressed to the extent possible by ensuring habitat for large forest owls and other hollow-breeding species, in the form of surveying for large or otherwise tree hollows, was conducted in the BAM plots and across the site generally. Similarly, observations on the potential occurrence of any large nests for raptors) was conducted simultaneously.

Surveys were conducted under the following licences; SL 100370. Soft copies of data files are saved on the Greenloaning Biostudies Server and on two separate hard drives held by the Accredited Assessor and author of this report, Alison Martin.

3. Site context

3.1 Assessment area

The subject property is within the Murray River Council Local Government Area and sits on the New South Wales side of the Murray River, approximately 6 kilometres East of the Victorian city of Swan Hill (Figure 2). The assessment area of 1,500 metres covers land in both Victoria and New South Wales. It includes approximately 3 kilometres of the Murray River and its riparian area.

The alluvial floodplains of the Victorian section of the assessment area are mostly irrigated cultivation with some cleared, uncultivated areas adjacent to the river. The New South Wales section includes residential development, a substantial golf course and large areas of cleared land on low fertility soils, the majority of which would have been historically cleared for grazing purposes (Figure 1, Figure 2 and Figure 4). There is some irrigated agricultural land mainly in the North-eastern section of the assessment area on the NSW side of the Murray River. There are only very small areas of remnant vegetation, primarily in a very narrow band along the Murray River, and areas of planted/regenerating vegetation associated with the development site, previously developed residential areas, roadsides and the golf course (refer to Figure 4 and Figure 5).

3.2 Landscape features

Landscape features identified within the subject land and assessment area are shown on Figure 1 Site Map and Figure 2 Location Map, respectively. The key relevant landscape features of the area are described above and in Section 1.1.3 and comprise:

- A highly modified topography and surface substrate encompassing the subject land, adjacent residential areas and golf course land as a result of development of these areas in the 1980s (refer to Figure 4 and Figure 5);
- Large areas of flat/gently undulating land, cleared for grazing/agriculture;
- A portion of the Murray River and associated floodplain to the South-west and south of the development site; and
- Small man-made water bodies associated with the golf course immediately adjacent to the site and also to the south and north (visible in the early stages of the golf course development as shown on Figure 5).

3.2.1 IBRA bioregions and IBRA subregions

The assessment area includes parts of the Riverina IBRA Region and it is located within the Murray Fans IBRA Subregion (New South Wales and Victoria) (Figure 2).

3.2.2 Rivers, streams, estuaries and wetlands

The Western boundary of the assessment area begins approximately 3 kilometres downstream from the junction of the Little Murray and Murray rivers (Figure 2). The Murray River flows through the assessment area in a South-easterly direction, for around 3 kilometres. The parts of the assessment area directly adjacent to the Murray River are dominated by seasonal floodplains, mainly on the Western side of the river.

The subject property is mostly level and has no distinct drainage lines.

The nearby golf course, to the South and South-east of the subject property contains 6 managed wetlands used for golfing water hazards. One of these wetlands is located along

The Southern boundary of the subject property. There is another of these types of wetlands to the North of the subject property (Figure 2).

There are two mapped floodplain wetlands mapped on the Victorian side of the Murray River (Figure 2).

3.2.3 Habitat connectivity

The main regional habitat connectivity values, within the assessment area, would be derived from the riparian area, and part of the floodplains, of the Murray River.

In a local sense, there would be some habitat connectivity between the patch of regenerated native vegetation to the North across Murray Downs Drive from the subject land (~14 hectares), the planted/regenerated native vegetation of the adjacent golf course, and another patch of planted/regenerated native vegetation to the South of the subject property (~13 hectares). There is some separation of these patches of native vegetation from the riparian and floodplain native vegetation of the Murray River (100 metres of cleared land).

3.2.4 Karst, caves, crevices, cliffs, rocks or other geological features of significance

There are no Karst, caves, crevices, cliffs, rocks or other geological features of significance associated with development site or environs.

The most recent (2.58 million years ago – present) geological formations, within the assessment are part of the Cenozoic Sedimentary Province comprise the following (NSW Codes – Figure 2):

- Subject Land - Q_acm - alluvial channel deposits - meander-plain facies - unconsolidated grey humic, clayey very fine-grained sand, typically overlying light brown clayey silt.
- Q_ddl - aeolian lunette - red-brown to light brown, silty bi-modal quartz sand, sporadically clayey; locally capped by off-white to beige mobile quartz sand. Regolithic carbonate accumulations at depth, including rhizolith development.
- Q_acw - alluvial channel deposits – subaqueous - fluvially deposited sand, gravel, silt, clay.

These geological descriptions were sourced from Department of Regional NSW (2022).

3.2.5 Areas of outstanding biodiversity value

A search of the Biodiversity Values Map (DPE, 2022) reveals that there is no biodiversity values (BV) land mapped for the subject land. The nearest BV land, within the assessment area, is mapped as ‘Biodiversity’ Riparian Land along the Murray River (Figure 2).

3.2.6 NSW (Mitchell) landscape

Two Mitchell Landscapes (Figure 2) occur within the assessment area, as follows:

- Mll Murray Lakes, Swamps and Lunettes, and
- Muc Murray Channels and Floodplains landscape.

Approximately one third of the assessment area (Figure 2) is within the Mll Mitchell (Riverina (RIV) Murray) Landscape (Mitchell, 2002).

This landscape comprises Murray Lakes, Swamps and Lunettes and includes parts of two land systems: Leaghur and Victoria.

Features of this landscape include large active freshwater lakes and swamps frequently flooded by the river, generally round or kidney shaped. These features are often within larger

relic Quaternary lake features. It is often made up of beaches, sand and clay pellet lunettes and sand hills on the eastern margins. Lake beds and associated channels of grey cracking clay, beaches of brown to white sands, lunettes of deep cemented yellow to white sands, with or without interbedded strata of pelleted clay.

Vegetation consists of scattered Black Box (*Eucalyptus largiflorens*), River Red Gum (*Eucalyptus camaldulensis*), Nitre Goosefoot (*Chenopodium nitrariaceum*) and Lignum (*Muehlenbeckia cunninghamii*) on lakebeds. Shallower swamps contain Cumbungi (*Typha orientalis*), Common Reed (*Phragmites australis*), Spike Rush (*Eleocharis* sp.) and Water Couch (*Paspalum paspalodes*).

Numerous aquatic plants occur in standing water. Lunettes and sand hills often have marginal River Red Gum, and stands of White Cypress Pine (*Callitris glaucophylla*), Prickly Wattle (*Acacia victoriae*), Sandhill Wattle (*Acacia ligulata*), Bluebush (*Maireana* sp.) and other grasses (Mitchell, 2002).

The southern areas of the assessment area, including the subject land, are located in the RIV – Murray, Muc Murray Channels and Floodplains landscape and includes parts of four land systems: Canally, Murrumbidgee, Riverland and Wentworth.

It comprises, active channels and seasonally inundated floodplains of the Murray streams in Quaternary alluvium with associated billabongs, swamps, channels, levees and source bordering dunes, relief to 10m. it also Includes scalded alluvial flats, broad elevated floodplains and associated relict channels and isolated sandy rises, with relief to 5m.

There are channel banks of grey and brown clays with River Red Gum (*Eucalyptus camaldulensis*), Black Box (*Eucalyptus largiflorens*), and River Cooba (*Acacia stenophylla*). River Red Gum occurs around billabongs with dense Lignum (*Muehlenbeckia cunninghamii*), Common Reed (*Phragmites australis*) and Cumbungi (*Typha orientalis*).

The flats of silty or cracking grey clays, are rimmed with Black Box, Lignum, and Canegrass (*Eragrostis australasica*).

This landscape's highest flooded terraces have brown clays or red-brown texture-contrast soils that carry Yellow Box (*Eucalyptus melliodora*).

The dunes and sandplains have deep sandy brown soils or texture-contrast soils, locally calcareous, with Belah (*Casuarina cristata*), White Cypress Pine (*Callitris glaucophylla*), mallee (*Eucalyptus* sp.), Rosewood (*Alectryon oleifolius*), Needlewood (*Hakea leucoptera*) and marginal clumps of Black Box, Belah, Prickly Wattle (*Acacia victoriae*) over Bluebush (*Maireana* sp.) and grasses (Mitchell, 2002).

3.2.7 Additional landscape features identified in SEARs

There are no Secretary's Environmental Assessment Requirements (SEARs) for the development.

3.2.8 Soil hazard features

There are no particular soil hazard features that occur within the subject land and assessment area.

3.3 Native vegetation cover

The recently completed NSW State Vegetation Type Map (Version C1.1.M1) (DPEx, 2022), was accessed in October 2022, to determine the extent and percentage of native vegetation within the assessment area, outside the subject land. The total native vegetation cover for the NSW section of the assessment area was 153.16 ha.

As the assessment area covers parts of NSW and Victoria, it was also necessary to access vegetation cover data from the Victorian Department of Environment, Land, Water & Planning (DELWP) (2022), Native Vegetation Information Map — Biodiversity Information: Native Vegetation, 2005 Ecological Vegetation. This data was digitised to determine area and native vegetation cover in the Victorian section of the assessment area was determined to be 23.3 ha.

Total native vegetation cover (including Victoria) within the assessment area was approximately 176.46 ha.

Refer to Section 2.2.2 for further details on the precautionary approach to the native vegetation mapping process.

The extent of native vegetation cover within the assessment area is summarised in Table 2. The native vegetation cover within the assessment area is shown on Figure 2 Location Map.

Table 2 Native vegetation cover in the assessment area

Assessment area (ha)	852.21
Total area of native vegetation cover (ha)	176.46
Percentage of native vegetation cover (%)	20.7
Class (0-10, >10-30, >30-70 or >70%)	10-30

4. Native vegetation, threatened ecological communities and vegetation integrity

4.1 Native vegetation extent

Refer to Section 2.2.2, Section 3.3, Table 2 and to Figure 7 for native vegetation extent.

4.1.1 Changes to the mapped native vegetation extent

There are no known differences between the actual native vegetation extent and that shown on the aerial imagery used in the figures provided in this BDAR.

4.1.2 Areas that are not native vegetation

The tree cover on the development site comprises predominantly planted trees not native to NSW and thus not associated with any PCT. There is, however, some regeneration/REGROWTH of native trees in the Southwest sector, some scattered regrowth of some understorey species, as well as the occurrence in the eastern sector of planted trees native to NSW but not native to the subject land locality. Refer also to Section 4.1 above, Figure 7 Native vegetation extent and Appendix D: Vegetation Survey Data.

4.2 Plant community types

4.2.1 Overview

As described in Sections 1.1.3, 2.2.2, 2.3.3 and 4.1.2 of this BDAR, the majority of the planted vegetation within the subject land does not align with any naturally occurring PCT, supporting a range of mallee and other dryland species from Victoria, South Australia, Western Australia and coastal NSW. The dominant species comprise the mallee, Salt River Gum (*Eucalyptus sargentiii*) (SA), Flat-topped Yate (*E.* occidentalis) (WA), Swamp Oak (*Casuarina glauca*) (Coastal NSW). Photographs of the planted vegetation are provided **in Appendix B.**

Only a very small sector in the south-west has been assessed as aligning, at least to some extent, with the BioNet Vegetation Classification PCT 10, as identified within Table 3. The extent of this PCT as recognised within the development site is shown on Figure 7 and Figure 8. Another PCT, a regenerating form of PCT 19, occurs along the roadside on the northern side of the development site, but does not occur within the site boundary per se. More detailed descriptions of each of these PCTs are provided in the following subsections, noting that PCT 19 is only adjacent to the development site, and no clearing of this PCT is proposed.

Table 3 PCTs identified within the subject land/immediately adjacent

PCT ID	PCT name	Subject land area (ha)
10	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	0.21
19	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains	0
Total area of vegetation representing a naturally occurring PCT		**0.21**
Total area to be cleared of all vegetation		**4.6**

4.2.2 PCT 10 River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.2.1 PCT overview

Key attributes of PCT 10 are provided below in Table 4 and subsequent text.

Table 4 PCT 10 River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

PCT ID	10
PCT name	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Vegetation formation	KF_CH9 Forested Wetlands
Vegetation class	Inland Riverine Forests
Per cent cleared value (%)	43
Extent within subject land (ha)	0.21

The small representation of PCT 10 on the development site is characterised by one large mature River Red Gum on the boundary, and overhanging BAM plot 4, a few small to medium mature Black box trees, and in part a dense tall shrub/small tree cover of primarily *Melaleuca* spp. The latter, however, shown in the centre background of the photograph below, are not listed as being characteristic of PCT 10. As is evident in the photograph below, the ground cover is variable, with substantial patches of bare ground and predominantly chenopod shrubs dominating the patches of low shrub cover. The only grass species in evidence at the time of survey was Five Minute Grass (*Tripogon loliformis*).

Photo 1 PCT 10 River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

4.2.2.2 Condition states

There is only one condition state of PCT 10 on the subject land.

4.2.2.3 Justification of PCT selection

The previous SVT mapping showed the majority of the site as supporting PCT 13, *Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverine Bioregion and Murray Darling Depression Bioregion,* with PCT 10 also represented in the North-western and South-eastern sectors of the development site. The selection of PCT as occurring on a small portion of the site, and the absence of PCT 13 is based on the following factors:

- The dominance of Black Box with some occurrence of River Red Gum matches the upper stratum description of PCT 10 in the Flora Survey module of the BioNet Vegetation Classification, and there is some concurrence with the listed ground stratum species;
- The occurrence of Black Box and River Red Gum is restricted to the south-western corner of the site, with other sectors of the site dominated by planted species, either not representing NSW species, or not representing a community naturally occurring in the area, viz the Swamp Oak (*Casuarina glauca*) dominated community occurring in the South-eastern corner of the subject land; and
- One of the key upper stratum species listed for PCT 13 is Lignum (*Muehlenbeckia florulenta*), which was not evident at the time of survey. This PCT also is described as an inner floodplain wetland, which does not fit with the site condition.

4.2.2.4 Alignment with TECs

There is no associated TEC for PCT 10.

4.2.2.5 Alignment with EPBC Act listed EC

There is no associated EC for PCT 10 listed under the EPBC Act within the BioNet Vegetation Classification.

4.2.3 PCT 19 Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains

4.2.3.1 PCT overview

A form of this PCT does not occur within the development site, but has regenerated along the roadside on the northern boundary of the site. Descriptions of the community have been included to show that the occurrence of the community has been recognised and considered as part of the preparation of the BDAR. Occasional specimens of species representative of PCT 19 could also occur, but such isolated occurrences within the highly modified planted vegetation would not represent PCT 19 per se.

Key attributes of PCT 19 are provided below in Table 5 and subsequent text.

Table 5 PCT 19 Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains

PCT ID	19
PCT name	Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains
Vegetation formation	KH_CH11B Semi-arid Woodlands (Shrubby sub-formation)
Vegetation class	Riverine Sandhill Woodlands
Per cent cleared value (%)	70
Extent within subject land (ha)	0

The community was not subject to detailed plot surveys, but the key feature observed was the consistent occurrence of White Cypress Pine (*Callitris glaucophylla*), intermingled with Eucalypt species and varying degrees of shrub cover (refer to photographs in **Appendix B**. As described in Section Field checks and detailed photographs were undertaken by the landowner to ensure that the community only occurred outside the property boundary and would not require any clearing.

Photo 1 PCT 19 Cypress Pine woodland of source-bordering dunes mainly on the Murray and Murrumbidgee River floodplains (photo J. Monahan)

4.2.3.2 Condition states

The main variation in condition states of the PCT outside the subject land is the variation in shrub/groundcover.

4.2.3.3 Justification of PCT selection

PCT 19 was recognised on the basis of its known previous occurrence in the general area and the consistent occurrence of White Cypress Pine (Callitris glauca). Descriptions of PCT 19 in the Flora Survey module of the BioNet Vegetation Classification have been taken into account, including [i]In most occurrences, the original understorey floristic composition has changed with the loss of palatable species and replacement of exotic grasses and forbs.'

4.2.3.4 Alignment with TECs

PCT 19 has an associated TEC; as listed under the BC Act, viz: *Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (Part).*

4.2.3.5 Alignment with EPBC Act listed ECs

PCT 19 has been nominated as an EC under the EPBC Act.

4.3 Threatened ecological communities

No TECs or ECs have been identified within the subject land. The occurrence of PCT 19 outside the subject land is shown on Figure 9.

4.4 Vegetation zones

Given the small size of both the subject site and specifically PCT 10, only one vegetation zone for the PCT was recognised, as indicated in Table 6. Other vegetation zones relate directly to the mapped extents of the various planted community types. Both the small extent of PCT 19, representing a TEC, and the site zones are shown on Figure 9, rather than on a separate figure.

Table 6 Vegetation zones and patch sizes

Vegetation zone ID	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	No. vegetation integrity plots used in assessment	Plot IDs of vegetation integrity plots used in assessment
Zone 1-PCT 10	PCT 10	Upper stratum species comprise River Red Gum and Black Box	0.21	☒ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☐ >100 ha	1	1	1	BAM 4

4.5 Vegetation integrity (vegetation condition)

4.5.1 Vegetation integrity survey plots

The total of 4 BAM plots sampled reflected the total size of the subject land (4.6 ha) and the variation in planted vegetation communities present. Thus, the number of plots required under the BAM 2020, Table 3, for an area of < 5 ha, i.e. 2 plots, has been exceeded, with the number for zone 1-PCT 10, with a total area of 0.21 ha, being 1 plot. The vegetation integrity score for this zone is documented in Table 7.

4.5.2 Scores

Table 7 Vegetation integrity scores

Vegetation zone ID	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
1 – PCT 10	20.6	26.3	50	30.3	No

4.5.3 Use of benchmark data

The source of benchmark data used to assess vegetation integrity attributes in zone 1 was the BioNet Vegetation Classification benchmark values.

5. Habitat suitability for threatened species

5.1 Identification of threatened species for assessment

5.1.1 Ecosystem credit species

Ecosystem credit species likely to occur/potentially occurring on the subject land at times are documented in Table 8 below. Justification for species removed from the BAM-C auto-populated list is provided below the table in accordance with BAM Subsections 5.2.1 and 5.2.2.

Table 8 Predicted ecosystem credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Australasian Bittern	*Botaurus poiciloptilus*	E	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	N/A	Moderate
Pied Honeyeater	*Certhionyx variegatus*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey	Yes		Zone 1 and 2	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
					☐ Current survey				
Little Pied Bat	*Chalinolobus picatus*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	High
Spotted Harrier	*Circus assimilis*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zone 1 and 2	Moderate
Varied Sitella	*Daphoenositta chrysoptera*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Grey Falcon	*Falco hypoleuco*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey	No	Vagrant species		Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
					☐ Current survey				
Black Falcon	*Falco subnige*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Vagrant species		High
Painted Honeyeater	*Grantiella picta*	V	V		☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Habitat Constraints		Moderate
Brolga	*Grus rubicunda*	V	Not listed		☒ BAM-C ☐ TBDC ☐ Previous survey	Yes	Habitat Constraints		Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
					☐ Current survey				
White-bellied Sea-eagle	*Haliaeetus leucogaster*	V	Not listed		☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones1 and 2	High
Black-breasted Buzzard (Foraging)	*Hamirostra melanosternon*	V	Not listed	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Little Eagle (foraging)	*Hieraaetus morphnoides*	V	Not listed	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones1 and 2	Moderate
White-throated Needletail	*Hirundapus caudacutus*	Not listed	V		☐ BAM-C ☒ TBDC ☐ Previous survey	No	Vagrant		High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
					☐ Current survey				
Swift Parrot (Foraging)	*Lathamus discolor*	Endangered	Critically Endangered	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones1 and 2	Moderate
Major Mitchell's Cockatoo (Foraging)	*Lophochroa leadbeateri*	V	Not listed	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Square-tailed Kite (Foraging)	*Lophoictinia isura*	V	Not listed	Yes	☐ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Hooded Robin (south-eastern form)	*Lophoictinia isura*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Barking Owl	*Ninox connivens*	V	Not listed	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	High
Corben's Long-eared Bat	Nyctophilus corbeni	V	V	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Vagrant species>		High
Gilbert's Whistler	Pachycephala inornata	V	Not listed	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Regent Parrot (eastern subspecies) (Foraging)	*Polytelis anthopeplus monarchoides*	E	V	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Habitat Constraint		Moderate
Superb Parrot (Foraging)	Polytelis swainsoni	V	V	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1 and 2	Moderate
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	V	Not listed	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Australian Painted Snipe	Rostratula australis	E	E	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes			Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	V	Not listed	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	High
Diamond Firetail	Stagonopleura guttata	V	Not listed	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	Moderate
Freckled Duck	Stictonetta naevosa	V	Not listed	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes			Moderate
Masked Owl (Foraging)	*Tyto novaehollandiae*	V	Not listed	Yes	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	Yes		Zones 1-3	High

Justification for removing species from the predicted ecosystem auto-populated list in the BAM C are as follows:

- **Australasian Bittern** – species relies on waterbodies/brackish or freshwater wetlands, none of which occur on the development site;
- **Grey Falcon** – there is only one historical (1955) record of the species within the IBRA subregion at the far south-eastern extremity, and the species is considered a vagrant and highly unlikely to use the development site for foraging;
- **Purple-crowned Lorikeet** - there are only three records of the species within the IBRA subregion over the past 15 years, two of which are at the far south-eastern extremity of the subregion. The species is considered a vagrant and highly unlikely to use the development site;
- **White-throated Needletail** - there are only two records of the species within the IBRA subregion, only one of which is recent, and the species is considered a vagrant and highly unlikely to use the development site; and
- **Corben's Long-eared Bat** - there is only one historical record (1988) of the species within the IBRA subregion, and the species is considered a vagrant and highly unlikely to use the development site within a predominantly cleared landscape.

5.1.2 Species credit species

There were no threatened flora species credit species auto-populated in the BAM C for the development site and other threatened species listed for the subregion were determined to have a low probability of occurrence on the site. Threatened fauna species credit species auto-populated in the BAM C for the development site, are listed in Table 9.

Table 9 Predicted fauna species credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Bush Stone-curlew	*Burhinus grallariu*	E	Not listed	No	☒ BAM-C ☒ TBDC ☐ Previous survey ☐ Current survey	No	Microhabitats – general habitat is highly degraded>	
White-bellied Sea-Eagle (Breeding)	*Haliaeetus leucogaster*	V	Not listed	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Habitat constraints	
Black-breasted Buzzard (Breeding)	*Hamirostra melanosternon*	V	Not listed	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	
Little Eagle (Breeding)	*Hieraaetus morphnoides*	V	Not listed	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zone 1 – PCT 10 and Zones 2 and 3

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Swift Parrot (Breeding)	*Lathamus discolor*	E	CE	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	
Southern Bell Frog	*Litoria raniformis*	E	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Microhabitats absent/degraded	
Major Mitchell's Cockatoo (Breeding)	*Lophochroa leadbeateri*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	
Square-tailed Kite (Breeding)	*Lophoictinia isura*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zone 1 – PCT 10 and Zones 2 and 3
Southern Myotis	*Myotis macropus*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zone 1 – PCT 10 and Zones 2 and 3
Barking Owl (Breeding)	*Ninox connivens*	V	Not listed	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Squirrel Glider	*Petaurus norfolcensis*	V	Not listed	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	
Koala	*Phascolarctos cinereus*	E	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes		Zone 1 – PCT 10 and Zone 2
Regent Parrot (eastern subspecies) (Breeding)	*Polytelis anthopeplus monarchoides*	E	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Geographic limitations	
Superb Parrot (Breeding)	*Polytelis swainsonii*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	
Masked Owl (Breeding)	*Tyto novaehollandiae*	V	Not listed	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraints	

Justification for removing species from the predicted ecosystem auto-populated list in the BAM C are as follows:

- **Bush Stone-curlew** – species relies on logs and dead timber, which are generally poorly represented on the development site as a whole and only to a minor extent within the very small representation of PCT 10. The development site overall is highly degraded, with heavy use of the site by local residents on motorised transport for passage through to the adjacent golf course (refer to photographs in Appendix B), and the species is not considered likely to occur.

- **Black-breasted Buzzard (Breeding)** –species requires 'land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts. Habitat is not present on the development site and the species is highly unlikely to use the development site for breeding;
- **Swift Parrot (Breeding)** –the development site does not represent important habitat for the Swift Parrot as per the Important Habitat Map for the species;
- **Southern Bell Frog** – although the species does not have specific habitat constraints listed under the TSDB, as per the profile for the species, it is 'usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys.' Such habitat is not present within the development site and the small occurrence of PCT 10, which can represent a wetland community, is highly degraded and not associated with wetland per se. The species is considered highly unlikely to use the development site;
- **Major Mitchell's Cockatoo (Breeding)** - the species requires 'Living or dead tree with hollows greater than 10cm diameter,' which are not represented within PCT 10, nor over the development site in general. The species therefore would not be expected to use the development site for breeding purposes.
- **Barking Owl (Breeding)** – the species requires 'Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.' Such habitat is not represented within PCT 10 or the development site in general and the species would not be considered likely to use the subject land for breeding purposes.
- **Squirrel Glider** - – although the species does not have specific habitat constraints listed under the TSDB, as per the profile for the species, in the western regions it tends to occupy mature/old growth forest, as well as requiring 'abundant tree hollows for refuge and nest sites.' Given the highly disturbed nature of the landscape encompassing the subject land, and the lack of any records of Squirrel Gliders within a 30km radius from the site, as well as a general lack of hollows within PCT 10 and the site in general, it is considered highly unlikely that the species would use the development site.
- **Regent Parrot (eastern subspecies) (Breeding)** – This species requires 'Living or dead *E. camaldulensis* with hollows greater than 5 cm diameter, greater than 5 m above the ground OR trees with DBH of greater than 40cm, within 1 km of watercourses or billabongs. Trees can be isolated but within 20 km of mallee. Habitat for this species would appear to be minimal on the development site, with no observed hollows and no large, old growth River Red Gums.
- **Masked Owl (Breeding)** - the Masked Owl requires 'Living or dead trees with hollows greater than 20cm diameter.' No hollows of this size were recorded either within PCT 10 or other sectors of the site and the species would not be considered likely to breed within the subject land. '.

5.2 Presence of candidate species credit species

Table 10 Determining the presence of candidate fauna species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present ?	Further assessment required? (BAM Subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Little Eagle (Breeding)	*Hieraaetus morphnoides*	V	Not listed	Targeted threatened species survey	No	No
Square-tailed Kite (Breeding)	*Lophoictinia isura*	V	Not listed	Targeted threatened species survey	No	No
Southern Myotis	*Myotis macropus*	V	Not listed	Assumed present	Assumed present	No
Koala	*Phascolarctos cinereus*	E	E	Assumed present	Assumed present	

5.3 Threatened species surveys

No specific surveys were required for threatened flora species (refer to Section 2.3.3)

Table 11 Threatened species surveys for candidate fauna species credit species on the subject land

Common name	Scientific name	Threatened fauna species surveys			Present	Further assessment required (BAM Subsections 5.2.5 and 5.2.6)
		Survey method (e.g. harp trap, Elliott trap, bioacoustics, etc.)	**Timing of survey – within recommended period?** (BAM-C / TBDC)	**Effort** (hours & no. people)		
Little Eagle (Breeding)	*Hieraaetus morphnoides*	Observations for any potential nest sites and use of binoculars to check any possible nest-like objects	☒ Yes 17/09/2023 10 am -5pm ☐ No <Dates & times>	1 hour 1 ecologist & 1 assistant	No	No
Square-tailed Kite (Breeding)	*Lophoictinia isura*	Observations for any potential nest sites and use of binoculars to check any possible nest-like objects	☐ Yes <17/09/2023 10 am -5pm ☐ No <Dates & times>	1 hour 1 ecologist & 1 assistant	No	No
Koala	*Phascolarctos cinereus*	Recording any potential Koala food trees and general visual observations for any signs of animals	☒ Yes <17/09/2023 10 am -5pm ☐ No <Dates & times>	1 hour 1 ecologist & 1 assistant	No	Yes

5.4 Expert reports

N/A

5.5 Area or count, and location of suitable habitat for a species credit species (a species polygon)

On the basis that of the tree species occurring on the subject land, only the River Red Gum is a favoured food tree of the Koala, the species polygon for the Koala encompasses only PCT 10 in which the River Red Gum occurs. The species polygon for the Southern Myotis also is focussed on PCT as the only vegetation representing a naturally occurring PCT within the

development site. The species polygons are shown on Figure 10. However, it would be expected that the majority of the site vegetation could be used as movement corridors between the various waterbodies off-site, and these waterbodies, as well as the Murray River, could provide foraging habitat for the Myotis. Potential foraging habitat covering the remainder of the site, but not subject to offset requirements under the BAM, viz:

> *If there is evidence that threatened species are using the planted native vegetation as habitat, the assessor must apply Section 8.4 of the BAM to mitigate and manage impacts on these species. Species credits are not required to offset the proposed impacts.*

is also shown on Figure 10. Further details relevant to the two species potentially occurring and the associated species polygons are provided in Table 12.

Table 12 Results for present species (recorded/assumed to be present within the subject land)

Common name	**Scientific name**	**Biodiversity risk weighting** (BAM-C & TBDC*)	**SAII entity**** (BAM-C & TBDC)	**Habitat constraints / microhabitats present on the subject land / vegetation zone**	**Abundance – No. individual plants present on subject land** (flora with unit of measure of count)	**Extent (ha) of suitable habitat present on site** (flora or fauna with unit of measure of area)	**TBDC species specific recommendations e.g. buffers, general comments** (where relevant)	**Habitat condition** (vegetation integrity score for each vegetation zone in the polygon – area species only)
Southern Myotis	*Myotis macropus*	High (2)	No	Predominantly movement habitat present over site with a number of water bodies adjacent to/nearby the site	N/A	4.6	As per the Threatened Bat Survey Guideline for the BAM, viz: *Species polygon boundaries should align with PCTs on the subject land to which the species is associated (listed in the TBDC) that are within 200m of waterbodies mapped.*	30.3
Koala	*Phascolarctos cinereus*	High (2)	No	River Red Gum food trees in pc 10	N/A	0.21	As per Koala Survey Guideline, viz ; *Where koala presence is assumed, the full extent of all PCTs on the subject land determined to be suitable habitat … are mapped as the species polygon*	30.3

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Table 13 Results for EPBC Act listed species present (recorded within the subject land)

Common name	**Scientific name**	**Abundance – No. individual plants present on subject land** (flora with unit of measure as count)	**Extent (ha) of suitable habitat present on site** (flora or fauna with unit of measure as area)
Koala	*Phascolarctos cinereus*		0.21

6. Identifying prescribed impacts

Table 14 Prescribed impacts identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / ☒No		
Human-made structures	☐Yes / ☒No		
Non-native vegetation	☒Yes / ☐No	The majority of the site supports replanted vegetation not native to NSW, plus some exotic weed infestations and garden escapes.	Possibly used for foraging by the microbat spp.
Habitat connectivity	☒Yes / ☐No	But not extensive – limited connectivity with other planted/regenerating vegetation to the south, to the east on the golf course and to the north across Murray Downs Drive	
Waterbodies, water quality and hydrological processes	☐Yes / ☒No	No water bodies on the site per se, but man-made water bodies adjacent/nearby and Murray River approximately 650 m away	Potential foraging habitat for the Southern Myotis
Wind turbine strikes (wind farm development only)	☐Yes / ☒No		
Vehicle strikes	☒Yes / ☐No	Murray Downs Drive to north and internal roads are planned	Koala/Southern Myotis

Adverse impacts on water quality, which could affect foraging habitat for the Southern Myotis are not expected as a result of the proposed development. A best practice stormwater management system is proposed to manage all aspects of hydrology associated with the proposed development, as per a best practice Stormwater Management Plan (SWMP) described in Section 1.1.3.

The proposed development could be expected to increase the risk of vehicle strike, particularly with increased traffic along the higher speed Murray Downs Drive. Vehicle speeds within the proposed development area will be subject to restrictions to protect humans, as well as wildlife.

Stage 2: Impact assessment (biodiversity values and prescribed impacts)

7. Avoid and minimise impacts

7.1 Avoid and minimise direct and indirect impacts

7.1.1 Project location

The project is located adjacent to existing residential development, within residential zoning, and will be interlinked with this development via internal roads (refer to Figure 3). The background to the location of the proposed development spans a number of decades, as explained in the following text provided by the landowner.

The area of the development site, Murray Downs, is a historic sheep station dating back to 1848, when it was first settled by Bell and Wilson. The Station became a quasi-village adjacent to the growing township of Swan Hill and flourished during the booming river trade era.

Swan Hill continued to expand, whilst Murray Downs Station (169,000 acres) was gradually subdivided down to the core 10,000 acres, which was purchased by the Kidman Reid family in 1969. Some years later, family patriarch Burnes Reid conceived of the need for a township on the New South Wales side of the Murray River with a vision to develop the area into a twin-towns concept, much like Echuca-Moama, Yarrawonga-Mulwala and Albury-Wodonga.

In the 1980's, Reid approached a Swan Hill golf club and negotiated to sell them a large area of sandhill country upon which to build a golf course and clubhouse. The Murray Downs Golf & Country Club thus was born, and Kidman Reid and Co formulated a very expansive plan to develop a vibrant village around the core golf course asset once it was fully constructed.

The golf course subsequently has developed a very high profile in the golfing universe, with many groups of golfers visiting the club annually and staying at the 50 room Murray Downs Resort. The regular golfing activity is driven largely by Swan Hill residents, many of whom, it is understood, wish to move to Murray Downs with a golf course view.

The residential components of the development now number around 100 homes and the developers and Murray River Council are in advanced discussions around upzoning further tranches of land in the immediate vicinity, with a view to bolstering development at Murray Downs to drive population growth and community development.

Council is presently developing a 30 year vision for Murray Downs, so it is anticipated that this project will be one of many over coming years as the stakeholders work co-operatively with Council to drive community development. The location of the current proposed developed therefore forms an integral component of the overall plan for urban development in the Murray Downs area.

Some of the areas identified for future development are similar to this particular project, being based on titles planted up with vegetation some 30 years ago when the golf course was constructed, whilst others are in locations totally cleared for grazing in the distant past.

7.1.2 Project design

Although it is well recognised that it would be desirable to retain some tree cover, based on the past experience of the landowner, including in the Murray Downs area, the proposed development is expected to require the removal of most vegetation from the site. For the purposes of this BDAR, given final detailed design is still pending, in the context of impacts, it

has been assumed that all existing vegetation will be removed. Any trees that can be safely retained once detailed design is completed however, will be subject to protective measures during clearing, construction and site development.

Where possible the developer will seek to retain vegetation along the boundaries, including adjacent to the man-made water bodies to minimise impact on wildlife using these water bodies, as well as to retain some movement corridor habitat. Whilst sightlines to the broader community are important to the development concept with a focus on golfing, vegetation retention to preserve and promote existing/potential wildlife use will be the key priority in this sector.

In addition, it is anticipated that Council permit conditions will require the conversion of some lots on the project to public open space, and it is proposed that planting for these areas will include local indigenous species. With regard to ongoing management of such areas, a similar management regime as has developed in other areas of Murray Downs village will be fostered by the developers. This regime has entailed neighbourhood residents taking pride in maintaining the local public areas and road reserves, with a form of local stewardship and a spirit of community ownership ensuing.

Each individual lot will be subject to a carefully developed and applied Section 88B Instrument which will not only prescribe controls on built-form development, but also on planted form. It is intended to stress therein the consideration for including native vegetation in the individual lot garden designs to be approved under the Section 88B approval process that will be managed by the developers.

Whilst the project is only five kilometres from the Swan Hill CBD by road, there is a section of road of about 2.5 to 3 kilometres that is very rural and passes beside the river, providing attractive views of dense bush on the opposite bank. This provides a background setting for the area of the natural environment, and the developers are keen to foster connectivity with the natural environment in the project execution wherever possible.

A key aim of the development philosophy is to connect the residents to nature, and to foster linkages to the heritage and history of the locality. Accordingly, whilst a key attractor of residents to the project will be a desire to visually interact with the golf course, the distant river environment and the open grazing paddocks, within this context, pains will be taken to retain appropriate vegetation wherever.

The pioneering heritage and natural environment of Murray Downs are key values in the community, and this will be supported and encouraged within this project.

7.2 Avoid and minimise prescribed impacts

7.2.1 Project location

There are no options to change the location of the project, as explained in section 7.1 above.

7.2.2 Project design

Prescribed impacts associated with the hydrology of the area (as identified in Section 6) will be minimised by best practice water management system to be developed for the project, as described in section 1.1.3. It is unlikely that potential impacts from increased risk of vehicle strikes on wildlife will be avoided, but they will be minimised as much as possible by internal road speed restrictions and appropriate signage.

7.3 Other measures considered

Retention of existing mature trees within the development has been considered, but past experience with the adjoining development indicated that this measure was, for the most part, unlikely to be practical in conjunction with the engineering constraints associated with such development. Notwithstanding such constraints, retention of some vegetation along the southern boundary at least is proposed.

7.4 Summary of measures to avoid and minimise impacts

Key measures to avoid or minimise impacts are summarised in Table 15 below.

Table 15 Avoidance and minimisation measures for direct, indirect and prescribed impacts

Action	Outcome (Describe the outcome of implementing the measure, with reference to specific entities identified in Sections 4 and 5)	Timing	Responsibility
Design of best practice water/hydrology management measures – Stormwater Management Plan (SWMP)	Minimisation of risk of adverse impacts on both man-made waterbodies and the natural drainage system to the Murray River, thereby minimising potential impact on wildlife using the waterbodies, particularly such species potentially as the Southern Myotis.	Pre-development	Project design engineer/developer
Pre-clearing surveys and clearing supervision according to best practice protocols	Minimising the risk of physical harm to wildlife during clearing operations	Pre-development/clearing for construction	Appropriately qualified ecologist Ecologist/wildlife carer
Installation and maintenance of speed restrictions and relevant signage	Encouraging as much as possible the reduction of risks of vehicle strike to wildlife, such as Koalas, that may at times be moving through the area from the riparian corridor along the Murray River	During clearing, construction and operational stages of project	Project design engineer/Council
Tree retention where possible, particularly along the boundary adjacent to waterbodies and preparation of Vegetation Management Plan (VMP)	Minimising impact on wildlife using the waterbodies, particularly such species potentially as the Southern Myotis.	Pre-development /during clearing	Project designer/ecologist

8. Impact assessment

8.1 Direct impacts

8.1.1 Residual direct impacts

Residual direct impacts from the development are summarised in Table 16 below and indicated on Figure 1.

Table 16 Summary of residual direct impacts

Direct impact (Describe the impact on PCT/TEC/EC or threatened species and their habitat)	**BC Act status**	**EPBC Act status**	**SAII entity**	**Project phase/timing of impact** (e.g. construction, operation, rehabilitation)	**Extent** (ha, number of individuals)
Clearing of PCT 10	Not a TEC	Not an EC	No	Construction	0.21
Clearing of planted vegetation	Not a TEC	Not an EC	No	Construction	4.45
Clearing of potential habitat for the Koala	E	E	No	Construction	0.21
Clearing of potential habitat for the Southern Myotis	V	Not listed	No	Construction	4.39

8.1.2 Change in vegetation integrity score

The final change in integrity score for the development site following clearing is shown below in Table 17.

Table 17 Impacts to vegetation integrity

Vegetation zone	**PCT ID**	**Management zone**	**Area** (ha)	**Before development**			**After development**			**Change**		
				Composition	**Structure**	**Function**	**VI score**	**Composition**	**Structure**	**Function**	**VI score**	**Change in VI score**
1	10	1	0.21	20.6	26.3	50	30.3	0	0	0	0	-30.3

8.2 Indirect impacts

Residual indirect impacts from the development are summarised in Table 18 below

Table 18 Summary of residual indirect impacts

Indirect impact (Describe impact, e.g. transport of weeds and pathogens form the site to adjacent vegetation)	**Impacted entities** (PCT/threatened entity and their habitats and where relevant, EPBC Act listing)	**Extent** (ha or zone reference)	**Frequency**	**Duration** (long-term/ short-term/ medium-term)	**Project phase/ timing of impact** (e.g. construction, operation, rehabilitation)	**Likelihood and consequences**
Increase in fragmentation of existing vegetation cover and increased exposure to exotic plant species introductions	Adjoining PCT 19 Vegetation adjoining property along southern boundary and water body	0.39 0.42	Single action from clearing	Long term	Clearing/construction	Long term increased pressure on remaining vegetation cover in the area from edge effects
Associated fragmentation of, and impacts on potential threatened species habitat	Southern Myotis	0.81	Single action from clearing, but long term impacts	Long term	Clearing/construction	Potential reduction in condition of remaining habitat for wildlife movement in the area
Pollution of adjacent/nearby waterbodies/Murray River	Adjacent/nearby waterbodies associated with the golf course/Murray River	c. 0.74 ha for closest waterbody	Ongoing	Long term	Clearing/construction/operation	Low if appropriate measures are followed
Potential harm to individual fauna during clearing operations	General fauna species	4.46 ha	Single action from clearing		Clearing	Low if appropriate measures are followed

The main limitation to the assessment is the lack of certainty regarding the use of the site by either the Koala or the Southern Myotis.

8.3 Prescribed impacts

8.3.1 Karst, caves, crevices, cliffs, rocks or other geological features of significance

Not applicable

8.3.2 Human-made structures

Not applicable

8.3.3 Non-native vegetation

8.3.3.1 Nature

Potential increase in edge effects in non-native vegetation along site boundaries.

8.3.3.2 Extent

Approximately 0.81 ha

8.3.3.3 Duration

Long term

8.3.3.4 Consequences

Potential decrease in condition of remaining vegetation

8.3.4 Habitat connectivity

8.3.4.1 Nature

Decrease in habitat connectivity in the area

8.3.4.2 Extent

Removal of 4.6 ha of connecting habitat (to varying degrees) on the development site and potential decrease in condition of adjoining habitat of approximately 0.81 ha.

8.3.4.3 Duration

Long term

8.3.4.4 Consequences

Reduction in extent and condition of movement corridors

8.3.5 Waterbodies, water quality and hydrological processes

8.3.5.1 Nature

Potential adverse impacts on water quality of man-made waterbodies adjacent to/nearby the development site

8.3.5.2 Extent

Expected to be minor and limited – minimised by development and implementation of best practice SWMP

8.3.5.3 Duration

Highest risk during construction, but lower risks long term

8.3.5.4 Consequences

Potential reduction in water quality, adding to existing impacts from existing development

8.3.5.5 Maximum predicted offset liability

Not applicable

8.3.6 Wind turbine strikes

Not applicable

8.3.7 Vehicle strikes

There are no threatened fauna species associated with a TEC occurring on the development site.

8.4 Mitigating residual impacts – management measures and implementation

The proposed mitigation and management measures for residual impacts for the development are summarised below in Table 19.

Table 19 Summary of proposed mitigation and management measures for residual impacts (direct, indirect and prescribed)

Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in Section 1.1)	**Method/technique**	**Timing**	**Frequency**	**Responsibility**	**Likely efficacy** (including risk of failure)	**MNES** (when relevant)
Development and implementation of best practice stormwater management system according to SWMP	Stormwater from roof catchments will be directed to stormwater tanks for reuse onsite On ground /surface runoff from will be captured via a proposed underground drainage system and directed via gross pollutant trap into existing irrigation storage within Murray Downs golf course (refer to Section 1.1.3 for more detail)	Pre-clearing and construction and operations	Ongoing	Design engineer/Council	Designed to be effective and to minimise risk of failure	N/A
Pre-clearing surveys/clearing supervision to minimise risk of harm to native fauna	Pre-clearing checks to determine the occurrence of any nests, microbats roosting under bark etc.	Pre-clearing and clearing for construction	Single period	Appropriately qualified ecologist	Efficient if conducted appropriately. Risk of harm	Koala

Mitigation measure (specify if none proposed and ensure an adaptive management strategy is developed and addressed in Section 1.1)	**Method/technique**	**Timing**	**Frequency**	**Responsibility**	**Likely efficacy** (including risk of failure)	**MNES** (when relevant)
	individual fauna in trees Subsequent supervision of clearing as determined to be appropriate by ecologist.			Appropriately qualified/experienced ecologist/wildlife carer	to wildlife minimised	
Restriction of vehicle speeds within proposed development area	Design, installation and maintenance of speed limit signage and potentially traffic slowing devices	Construction and operation	Ongoing	Design engineer/developer/Council	Expected to be reasonably effective and ongoing maintenance will minimise risk of failure	Koala
Retention of existing vegetation along southern boundary as much as possible	Vegetation barrier to be protected	Pre-clearing	Ongoing	Developer	Effective if managed appropriately	N/A
Retention of mature River Red Gum and other vegetation along south-western boundary if possible	To be protected from clearing	Pre-clearing	Ongoing	Developer	Effective if managed appropriately	Koala
Landscaping to include native species occurring in the area	Planting to re-establish some connectivity with nearby vegetation where possible	Construction and development	Ongoing	Developer/bush regenerator	Effective if managed appropriately	N/A
Preparation and implementation of a vegetation management plan for the site, in consultation with the community, to organise and manage the above measures		Pre-construction	Initial preparation, then subject to monitoring and review	Ecologist & bush regenerator	Effective if managed appropriately	N/A

Table 20 Summary of implementation processes for management measures

Measure/action	**Monitoring and evaluation strategy** (Data, frequency, timing and reporting)	**Performance criteria** (linked to monitoring and evaluation strategy)	**Adaptive management threshold** (trigger for adaptive management plan/actions)	**Adaptive management response** (when triggered)
Development and implementation of best practice water management system via SWMP	Regular monitoring and reporting requirements to be specified in water management system document	Existing water quality remains constant within the levels set within the water management system document	Adaptive management actions will be triggered if water quality standards do not fall within the levels set within the water management system document	To be stipulated within the water management system document
Pre-clearing surveys/clearing supervision to minimise risk of harm to native fauna	Simple, single summary of outcomes	Harm to fauna is avoided	Adaptive management is required if nesting birds or other fauna activity is recorded during pre-clearing surveys. Best practice management protocols would be followed	Adherence to pre-set protocols
Retention of existing vegetation along southern boundary where possible	Regular monitoring and reporting requirements to be specified in Vegetation Management Plan	Performance criteria to be specified in the Vegetation Management Plan	Adaptive management actions will be triggered if regeneration and landscaping outcomes are not meeting the performance criteria specified in the Vegetation Management Plan	To be specified in the Vegetation Management Plan
Retention of mature River Red Gum along south-western boundary if possible				
Landscaping to include native species occurring in the area				
Preparation and implementation of a vegetation management plan for the site to organise and manage the above measures				

8.5 Adaptive management strategy for uncertain impacts (where relevant)

Impacts which can be identified as remaining uncertain comprise;

- The extent to which individual fauna may be adversely affected by the clearing operations, both in the short and long term; and
- Whether the proposed development will result in additional vehicle strikes, either within the development site or on Murray Downs Drive adjacent to the site.

Mitigation measures have been proposed to minimise the risk of vehicle strikes and it is expected that the incidence of such strikes will be very low. Adaptive management strategies would be required if this was found not to be the case, and would entail identification of the main risk area/s and specific characteristics of such areas, and consideration of both the species involved and the nature of the strike. Removal of any dead animals from the curb side would, for instance, reduce the risk of carrion feeders being involved in a vehicle strike, and such actions could form part of active community management of the site.

The options for mitigation measures to address the impact of clearing on individual fauna are limited, and include:

- Minimising risk of physical harm during clearing operations;
- Retention of some vegetation along the southern boundary to provide habitat buffers and movement corridor;
- Use of some plant species native to the area in open space plantings; and
- Encouragement of similar use of such species in residential gardens.

There is no doubt that some individuals of some species which regularly or consistently use the development site will be impacted both in the short and long term by the removal of habitat, albeit not of high quality in general. Nectivorous birds for instance, will be subject to a reduction in flowering eucalypts in the area. An adaptive management strategy, other than for individuals during pre-clearing and clearing operations, does not have ready application to the long term removal of, and increased fragmentation of habitat. However, additional compensatory measures to be considered during the construction and operational stages could include nest box installation and monitoring, and enhancement measures for the TEC along the roadside.

9. Serious and irreversible impacts

9.1 Assessment for serious and irreversible impacts on biodiversity values

N/A – no SAII entities are associated with the development site

10. Impact summary

10.1 Determine an offset requirement for impacts

10.1.1 Impacts on native vegetation and TECs or ECs (ecosystem credits)

The majority of the development site vegetation comprises predominantly non-native and native planted vegetation, and as such is not subject to the BAM assessment and associated offset requirements. A summary of relevant matters pertaining to the non-offset vegetation is provided in Table 21 below. The small sector of the development site supporting planted/regrowth vegetation which represents a naturally occurring PCT in the area has been deemed to be subject to the BAM assessment and associated offset requirements. A summary of relevant matters pertaining to this PCT is provided in Table 21 below.

Table 21 Impacts that do not require offset – ecosystem credits

Vegetation zone	PCT name	TEC	Impact area (ha)	TEC association	Entity at risk of an SAII?	Current VI score
2 and 3	N/A – planted vegetation	N/A	3.39	N/A	No	N/A

Table 22 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
1	10 - River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion	No	0.21	30.3	0	-30.3	1.5	2
							Total credits	2

10.1.2 Impacts on threatened species and their habitat (species credits)

Table 23 Impacts that require an offset – species credits

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Southern Myotis	*Myotis macropus*	V	Not listed	0.21 ha	2	3
Koala	*Phascolarctos cinereus*	E	E	0.21 ha	2	3
					Total credits	6

10.1.3 Indirect and prescribed impacts

The main measures to offset residual prescribed impacts are summarised in Table 24 below.

Table 24 Summary of proposed offsets for residual indirect and prescribed impacts

Residual indirect or prescribed impact (identified in 2**0** after mitigation)	**Proposed offset** (additional biodiversity credit requirement and/or other conservation measures)
Potential for vehicle strike within proposed development site	Design, implementation and ongoing management of speed restriction measures
Increased habitat fragmentation, associated loss in habitat connectivity and increased risk of weed invasions to remaining vegetation in area	Development and implementation of a VMP

10.2 Impacts that do not need further assessment

Table 25 Impacts that do not need further assessment for ecosystem credits

Impact	**Location within subject land**	**Justification why no further assessment is required**
Clearing of planted vegetation	Zones 2 and 3	Vegetation does not represent any community occurring naturally in the area

11. Biodiversity credit report

The full Biodiversity Credit Report and associated reports from the BAM Calculator, are provided in Appendix E

11.1 Ecosystem credits

Table 26 Ecosystem credit class and matching credit profile

Ecosystem credit	Attributes shared with matching credits						
	PCT name	**PCT vegetation class**	**PCT vegetation formation**	**Associated TEC or EC**	**Offset trading group** (BAM Section 10.2, Tables 4 & 5)	**Hollow bearing trees present?**	**IBRA subregion** (in which proposal is located)
2	River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Inland Riverine Forests	Forested Wetlands	No	Inland Riverine Forests	No	Murray Fan

11.2 Species credits

Table 27 Species credit class and matching credit profile

Species credit	Attributes shared with matching credits				
	Name of threatened species	Kingdom	BC Act status	EPBC Act status	IBRA region
3	Koala		E	E	Murray Fan
3	Southern Myotis		v	Not listed	Murray Fan

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13. Figures

Figure 1 Site Map

Figure 2 Location Map

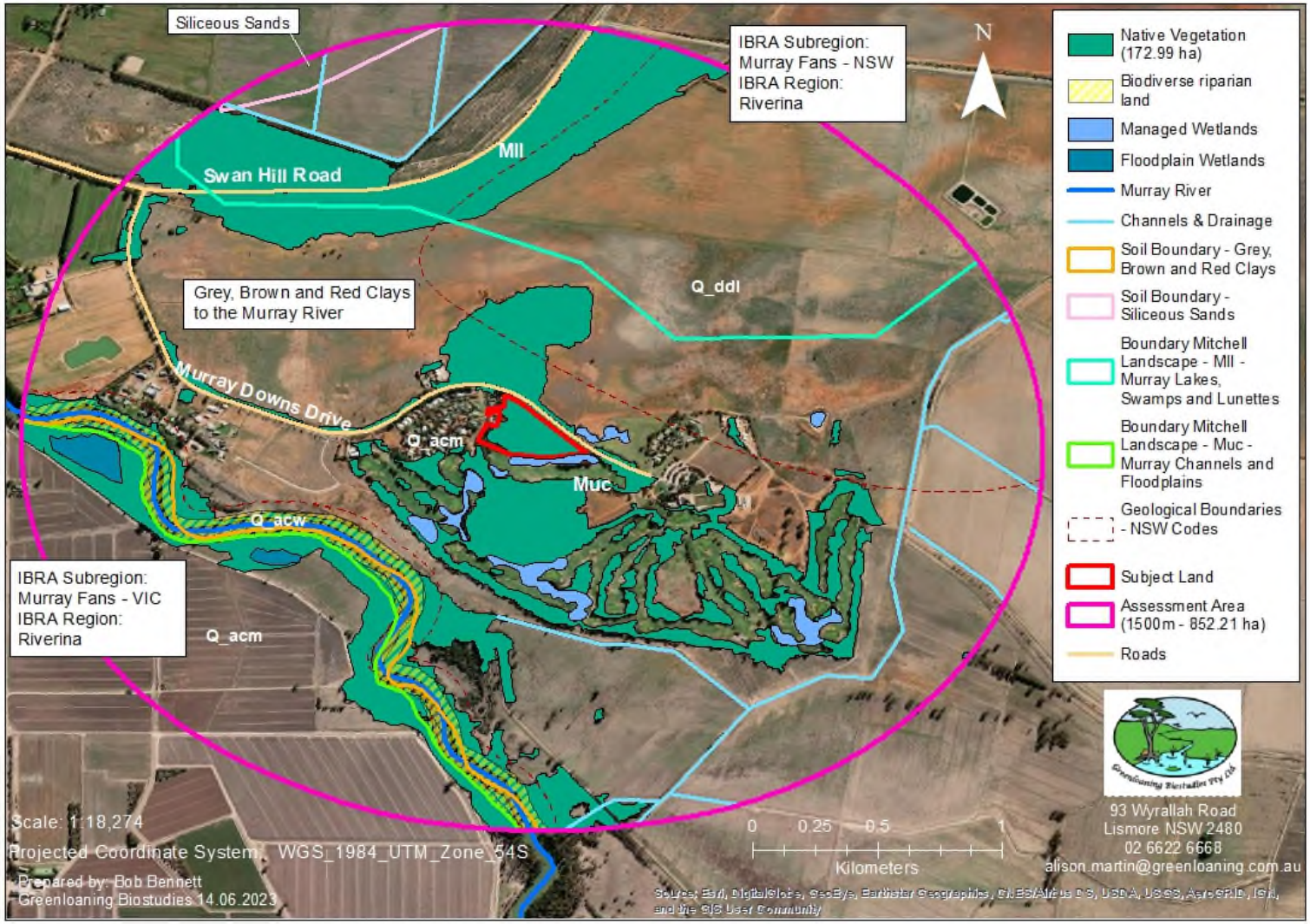


Figure 3 Development layout

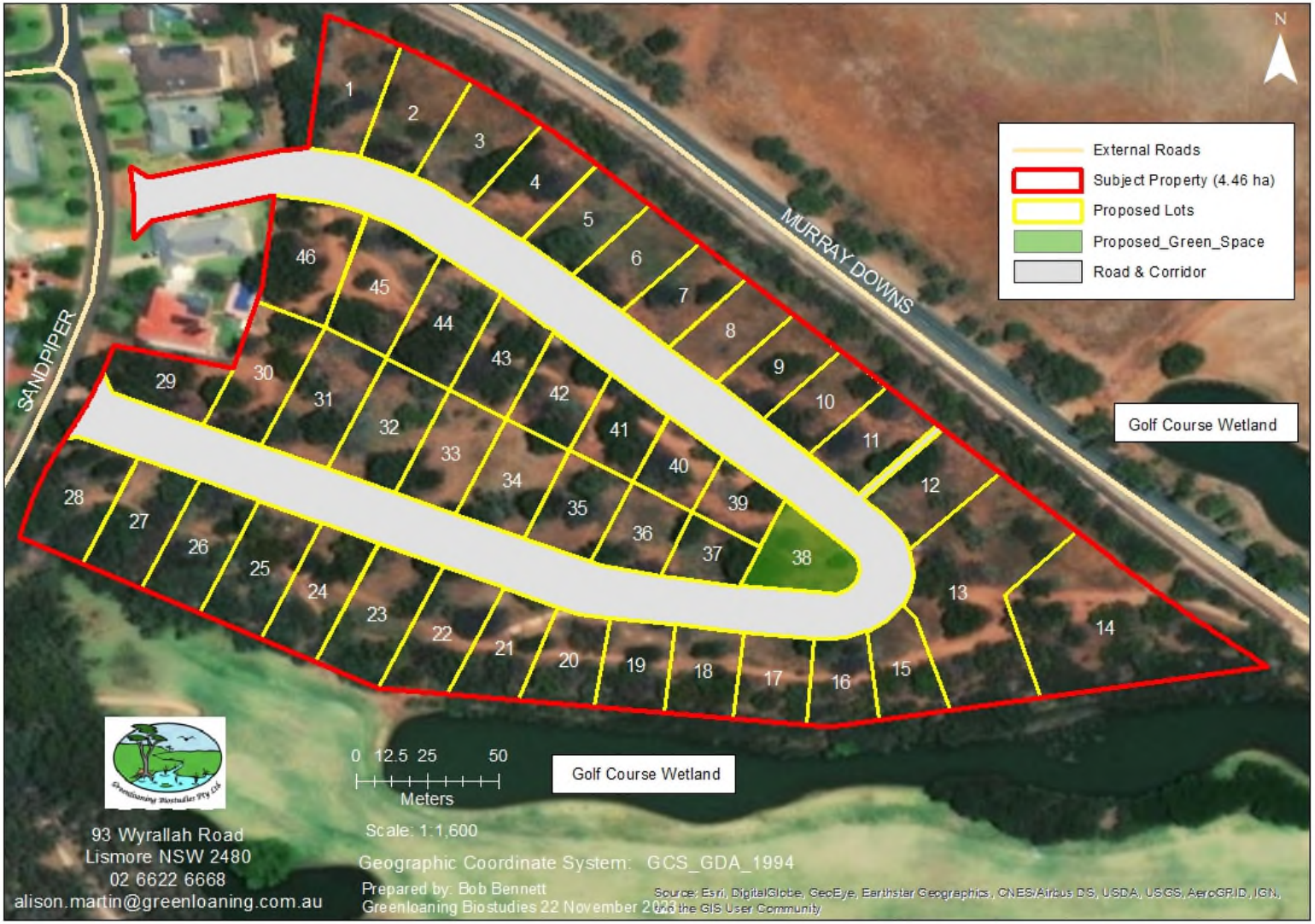


Figure 4 Historical Photograph – 1961

1961 Image

Figure 5 Historical Photograph of site and environs– 1991

1991 Image

Figure 6 Field survey locations

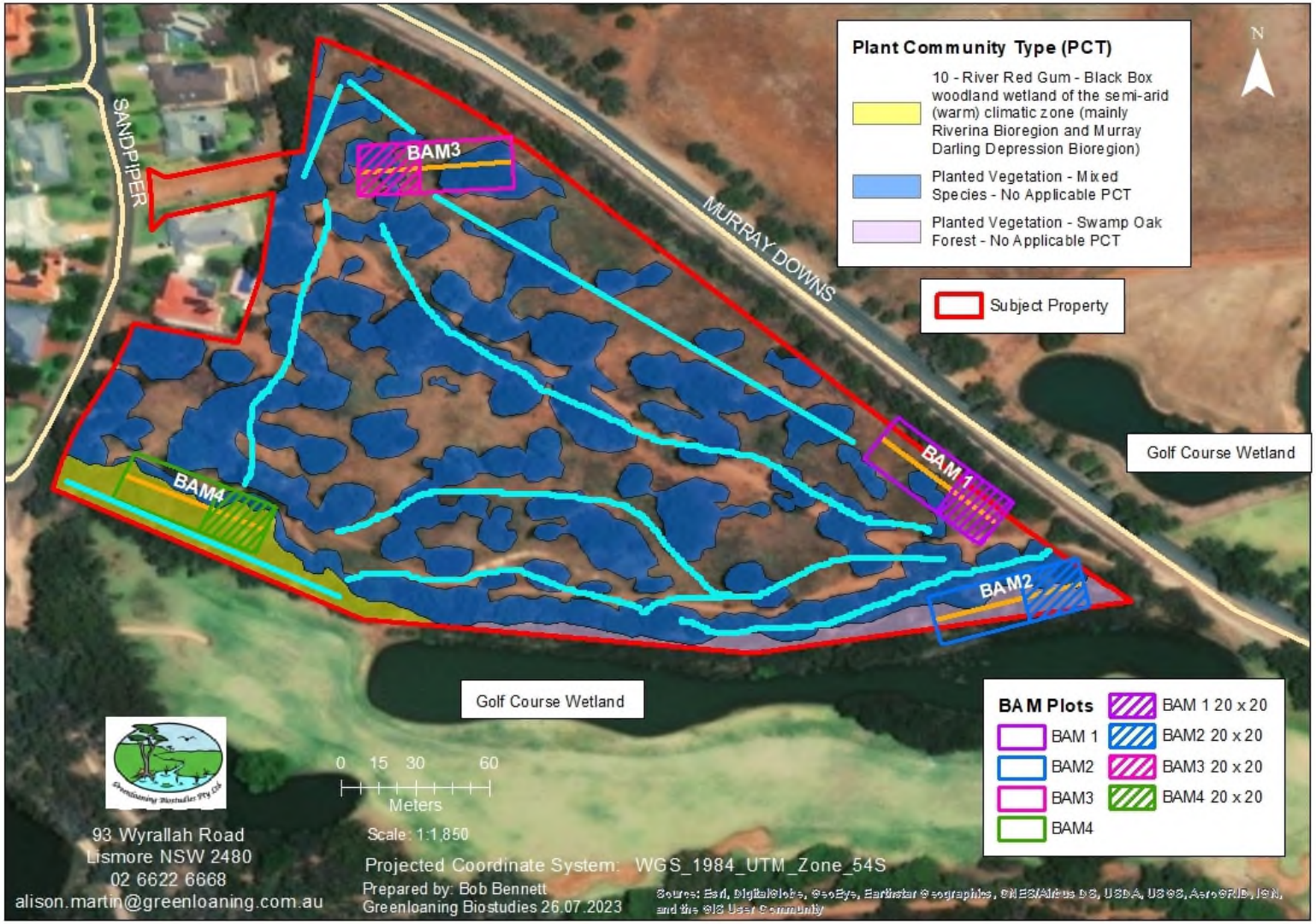


Figure 7 Native vegetation extent

Figure 8 **Plant community types**

Figure 9 Threatened ecological communities and ecological communities and vegetation zones

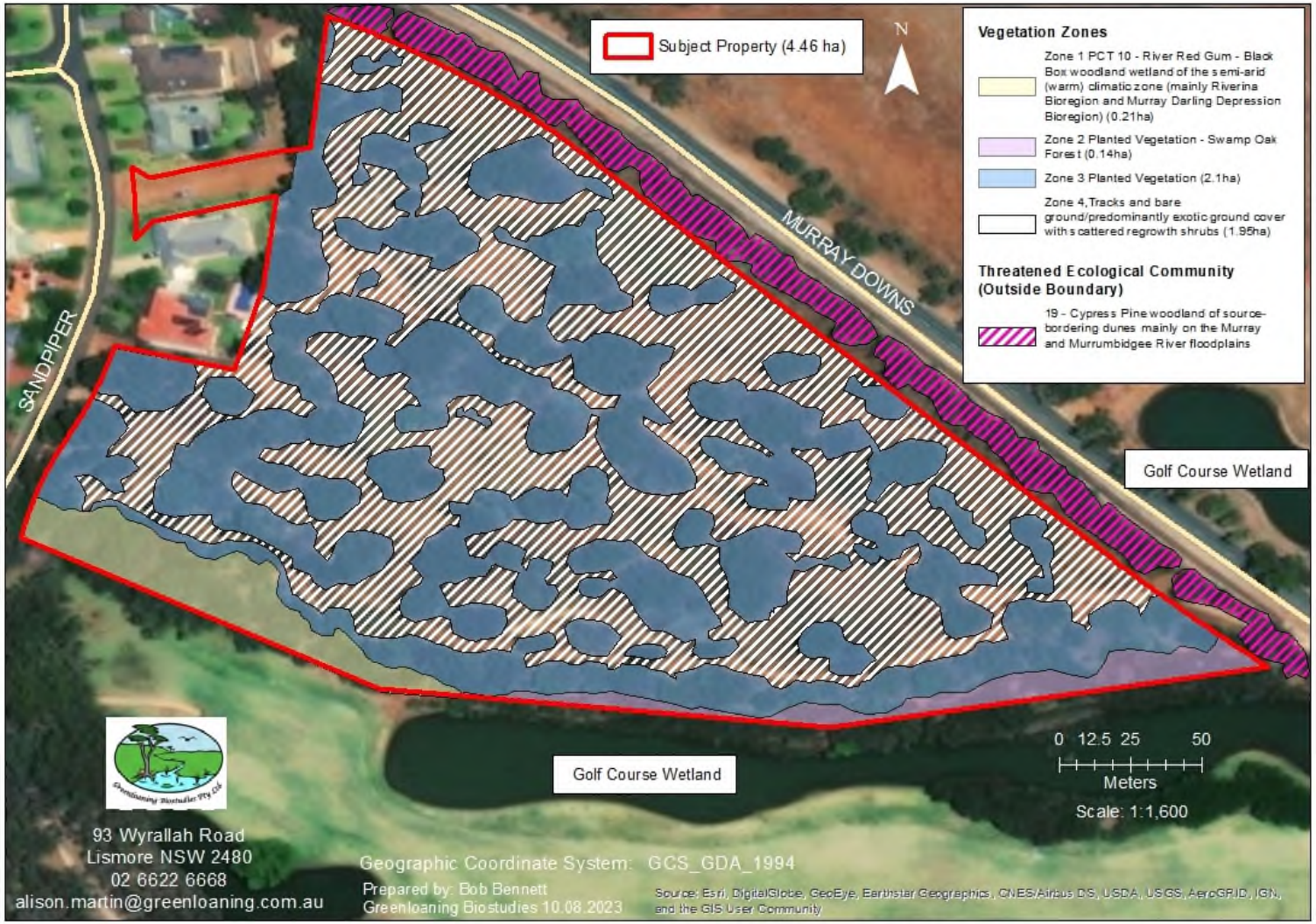
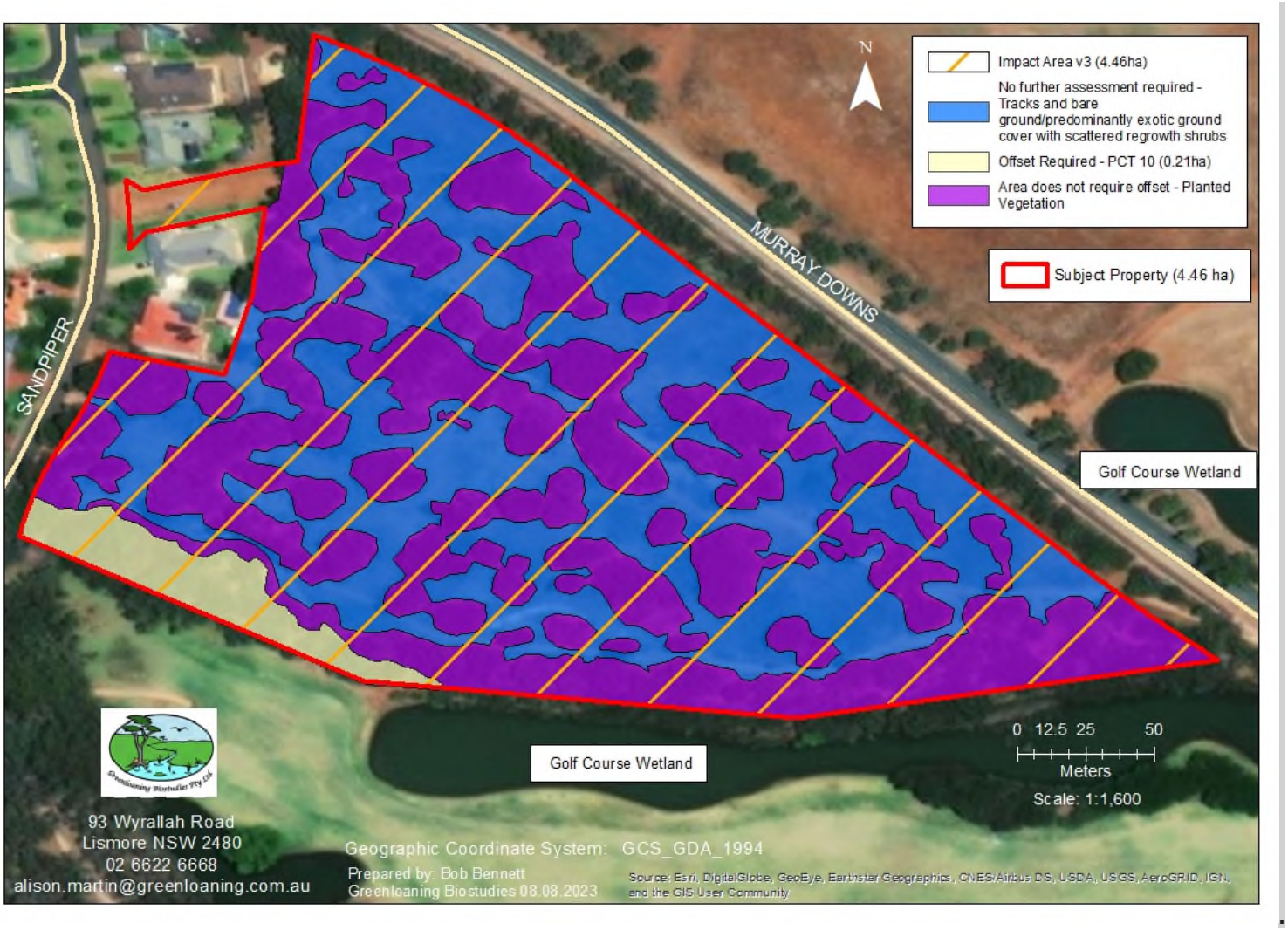


Figure 10 Candidate species credit species records and species

Figure 11 Candidate species credit species records and species polygons



Appendix A: BDAR requirements compliance

A.1 BDAR requirements compliance

Table A1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including:	–
		☒ brief description of the proposal	1.1.1
		☒ identification of subject land boundary, including: ☒ operational footprint ☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	1.1.3
		☒ general description of the subject land	1.1.3
		☒ sources of information used in the assessment, including reports and spatial data	1.5
		☒ identification and justification for entering the BOS	1.2
		Maps and tables	
		☒ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Landscape	Sections 3.1 and 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including:	–
		☒ general description of subject land topographic and hydrological setting, geology and soils	1.1.3
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	Table 3
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	3.2.1
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	3.2.2
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	3.2.2
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	3.2.3
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.))	3.2.4
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.))	3.2.5
		☒ any additional landscape features identified in any SEARs for the proposal	3.2.7
		☒ NSW (Mitchell) landscape on which the subject land occurs	3.2.6
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 Section 2.4)	2.1
		Maps and tables	
		☒ Site Map ☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM Subsection 3.1.3	Figure 1
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of subject land	Figure 2 Location

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM Subsection 3.1.3 ☒ Additional detail (e.g. local government area boundaries) relevant at this scale	
		Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	–
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries ☒ wetlands and important wetlands ☒ connectivity of different areas of habitat ☐ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ☐ areas of outstanding biodiversity value occurring on the subject land and assessment area ☒ any additional landscape features identified in any SEARs for the proposal ☒ NSW (Mitchell) landscape on which the subject land occurs	Figure 1 & Figure 2
		Data	
		☒ All report maps as separate jpeg files	–
		Individual digital shape files of:	–
		☒ subject land boundary	–
		☒ assessment area (i.e. subject land and 1500 m buffer area) boundary	–
		☒ cadastral boundary of subject land	–
		☒ areas of native vegetation cover	–
		☒ landscape features	–

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Native vegetation	Chapter 4, Appendix A and Appendix H	**Information**	
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	4.1 & Figure 7
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	4.1.2
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	2.2.2
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	2.2.3
		☐ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	N/A
		For each PCT within the subject land, describe:	–
		☒ PCT name and ID	4.1 & Figure 78
		☒ vegetation class	4.1.2
		☒ extent (ha) within subject land	2.2.2 & Figure 8
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.))	2.2.3
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	4.2.2 AND Appendix D
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	<4.1 & 9>
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	<4.1.2>Table 4 & 5
		Describe the vegetation integrity assessment of the subject land, including:	–
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	<4.4 & Figure 10>

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	<4.4
		☒ area (ha) of each vegetation zone	<4.4>& Figure 10>
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	<4.4>
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	<4.5.1>
		☒ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	<4.5.3>
		Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A):	–N/A
		☒ identify the PCT or vegetation class for which local benchmark data will be applied ☐ identify published sources of local benchmark data (if benchmarks obtained from published sources) ☐ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	<4.5.3>
		☐ provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	N/A
		☐ provide written confirmation from the decision-maker that they support the use of local benchmark data	N/A
		Maps and tables	
		☒ Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 7
		☒ Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 8
		☒ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 109
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 6 Field survey locations
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	<Figure 9 9 & **Error! Reference s**

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
			ource not found.>
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	<Figure 10 & Table 6>
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	<Table 7>
		☒ composition condition score ☒ structure condition score ☒ function condition score ☒ presence of hollow bearing trees	
		Data	
		☒ All report maps as separate jpeg files	–
		☒ Plot field data (MS Excel format)	
		☒ Plot field datasheets	<Appendix D>
		Digital shape files of:	–
		☒ PCT boundaries within subject land	–
		☒ TEC boundaries within subject land	–
		☒ vegetation zone boundaries within subject land	–
		☒ floristic vegetation survey and vegetation integrity plot locations	–
Threatened species	Chapter 5	**Information**	
		Identify ecosystem credit species likely to occur on the subject land, including:	–
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.))	< Table 8 >
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	<5.1.1>
		☐ justification for addition of any ecosystem credit species to the list	N/A
		Identify species credit species likely to occur on the subject land, including:	–
		☒ list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1)	<and the species is considered a

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
			vagrant and highly unlikely to use the development site within a predominantly cleared landscape. **13.1.1 Species credit species** There were no threatened flora species credit species auto-populated in the BAM C for the development site and other threatened species listed for the subregion were determined to have a low probability of occurrence on the site. Threatened fauna species credit species auto-populated in the BAM C for the development site, are listed in Table

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	<5.1.2>
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2)	<5.1.2>
		☐ justification for addition of any species credit species to the list	N/A
		From the list of candidate species credit species, identify:	–
		☒ species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.))	<**Error! Reference source not found.**0 & Table 101>
		☐ species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.))	N/A
		☐ species for which targeted surveys are to be completed to determine species presence (BAM Subsection 5.2.4(2.b.))	N/A
		☐ species for which an expert report is to be used to determine species presence (BAM Subsection 5.2.4(2.c.))	N/A
		Present the outcomes of species credit species assessments from:	–
		☒ threatened species survey (as described in BAM Section 5.2.4)	<**Error! Reference source not found.**2 & Table 113>
		☐ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Subsection 5.2.4, Section 5.3, Box 3)	N/A
		Where survey has been undertaken include detailed information on:	–
		☒ survey method and effort (as described in BAM Section 5.3)	<**Error! Reference source not found.**1
		☒ justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	<5.3>

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☐ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	N/A
		☐ survey personnel and relevant experience	
		☒ describe any limitations to surveys and how these were addressed/overcome	<5.3>
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	–
		☐ justification of the use of an expert report ☐ identify the expert, provide evidence of their expert credentials and departmental approval of expert status ☐ all requirements of Box 3 have been addressed in the expert report	N/A
		Where use of local data is proposed (BAM Subsection 1.4.2):	N/A
		☐ identify relevant species ☐ identify data to be amended ☐ identify source of information for local data, e.g. published literature, additional survey data, etc. ☐ justify use of local data in preference to VIS Classification or TBDC data	
		☐ provide written confirmation from the decision-maker that they support the use of local data	
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	–
		☒ the unit of measure for each species is documented	<Table 12 & Table 133>
		for species assessed by area:	–
		☒ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	<Figure 11>
		☒ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	<5.5>
		for species assessed by counts of individuals:	–
		☐ the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.))	N/A>

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☐ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	N/A >
		☐ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	N/A >
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	<Table 122
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	Table 8
		☒ the ecosystem credit species removed from the list	
		☒ the sensitivity to gain class of each species	
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	• <and the species is considered a vagrant and highly unlikely to use the development site within a predominantly cleared landscape.

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
			13.1.2 Species credit species There were no threatened flora species credit species auto-populated in the BAM C for the development site and other threatened species listed for the subregion were determined to have a low probability of occurrence on the site. Threatened fauna species credit species auto-populated in the BAM C for the development site, are listed in Table 9 & Table 90>
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	
		☒ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable	<5.5 & Table 122 & Table 133>

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	
		☐ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)	N/A>
		Data	
		☐ Digital shape files of suitable habitat identified for survey for each candidate species credit species	–
		☒ Survey locations including GPS coordinates of any plots, transects, grids	
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	–
		☒ Species polygon map in jpeg format	–
		☐ Expert reports and any supporting data used to support conclusions of the expert report	N/A
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Prescribed impacts	Chapter 6	**Information**	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	–
		☐ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) ☐ occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) ☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) ☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	<Table 144 & 8.3>
		☐ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5)	N/A
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)	<Table 144>
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g. Subsection 6.1.3)	<8.3.5>
		Where the proposed development is for a wind farm:	–N/A
		☐ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5)	>
		☐ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	
		☐ predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Where the proposal may result in vehicle strike:	–
		☐ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	N/A >
		Maps and tables	
		☒ Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figure 2, Figure 11
		☐ Map showing location of potential vehicle strike locations	N/A
		☐ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	N/A >
		Data	
		☒ Digital shape files of prescribed impact feature locations	–
		☒ Prescribed impact features map in jpeg format	–
Avoid and minimise impacts	Chapter 7	**Information**	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	–
		☐ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	N/A >
		☐ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	N/A
		☐ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	N/A
		☐ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	N/A
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2)	<7.1.2 & 7.2.2>
		☐ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	< N/A >
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	<7.3>

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Maps and tables	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	<Table 159>
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values (N/A); and of the final proposal footprint, including construction and operation	<Figure 3 Development layout3>
		☐ Maps demonstrating indirect impact zones where applicable	<**Error! Reference source not found.**>
		Data	
		Digital shape files of:	–
		☒ alternative (N/A)and final proposal footprint	–
		☒ direct and indirect impact zones	–
		☒ Maps in jpeg format	–
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	**Information**	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	<8.1, 8.2, 813, Table 166 & Table 18>
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):	–
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	<Table 1818>
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	<8.2>
		☒ reporting any limitations or assumptions, etc. made during the assessment	<8.2>
		☒ identification of the threatened entities and their habitat likely to be affected	<Table 1823>
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	–
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	–7.2, Table 15, Table 18
		☐ karst, caves, crevices, cliffs, rocks and other features of geological significance	<8.3.1>

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☐ human-made structures	<8.3.2>
		☒ non-native vegetation	<8.3.3>
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	<8.3.4>
		☒ movement of threatened species that maintains their life cycle	<8.3.4>
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	<8.3.5>
		☐ assessment of the impacts of wind turbine strikes on protected animals	N/A>
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	<8.3.7>
		☒ evaluate the consequences of prescribed impacts	<1.1>
		☒ describe impacts that are uncertain	<8.5
		☒ document limitations to data, assumptions and predictions	<2.6, 8.2 >
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	<Table 17>
		Data	
		N/A	–
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	**Information**	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5 including:	–
		☒ techniques, timing, frequency and responsibility	<Table 1919>
		☒ identify measures for which there is risk of failure	
		☒ evaluate the risk and consequence of any residual impacts	
		☒ document any adaptive management strategy proposed	<>Table 20
		Identification of measures for mitigating impacts related to:	–
			<7.2, Table 19>

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ displacement of resident fauna (as described in BAM Subsection 8.4.1(2.))	
		☒ indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.))	
		☒ mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	
		☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	<Table 20>
		Maps and tables	
		☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	<Table 19>
		Data	
		N/A	–
Impact summary	Chapter 9	**Information**	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including:	–N/A
		☐ addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	
		☐ for each TEC, report the extent of the TEC in NSW	
		☐ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	
		☐ for each threatened species, report the population size in NSW	
		☐ documenting assumptions made and/or limitations to information	
		☐ documenting all sources of data, information, references used or consulted	
		☐ clearly justifying why any criteria could not be addressed	
		☐ Identification of impacts requiring offset in accordance with BAM Section 9.2	
		☐ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	
		☐ Identification of areas not requiring assessment in accordance with BAM Section 9.3	
		Maps and tables	
		☐ Map showing the extent of TECs at risk of an SAII within the subject land	N/A
		☐ Map showing location of threatened species at risk of an SAII within the subject land	N/A

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Map showing location of:	–
		☒ impacts requiring offset	<**Error! R eference source not found.**1>
		☒ impacts not requiring offset	<**Error! R eference source not found.**>
		☒ areas not requiring assessment	<**Error! R eference source not found.**1>
		Data	
		Digital shape files of:	–
		☐ extent of TECs at risk of an SAII within the subject land	–N/A
		☐ location of threatened species at risk of an SAII within the subject land	–N/A
		☒ boundary of impacts requiring offset	–
		☒ boundary of impacts not requiring offset	–
		☒ boundary of areas not requiring assessment	–
		☒ Maps in jpeg format	–
Impact summary	Chapter 10	**Information**	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	–
		☒ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) ☒ change in vegetation integrity score (BAM Subsection 8.1.1) ☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 10.1.2)	<Table 2222>
		☒ biodiversity risk weighting for each	<Table 2222 & Table 23>
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)	<Table 23>

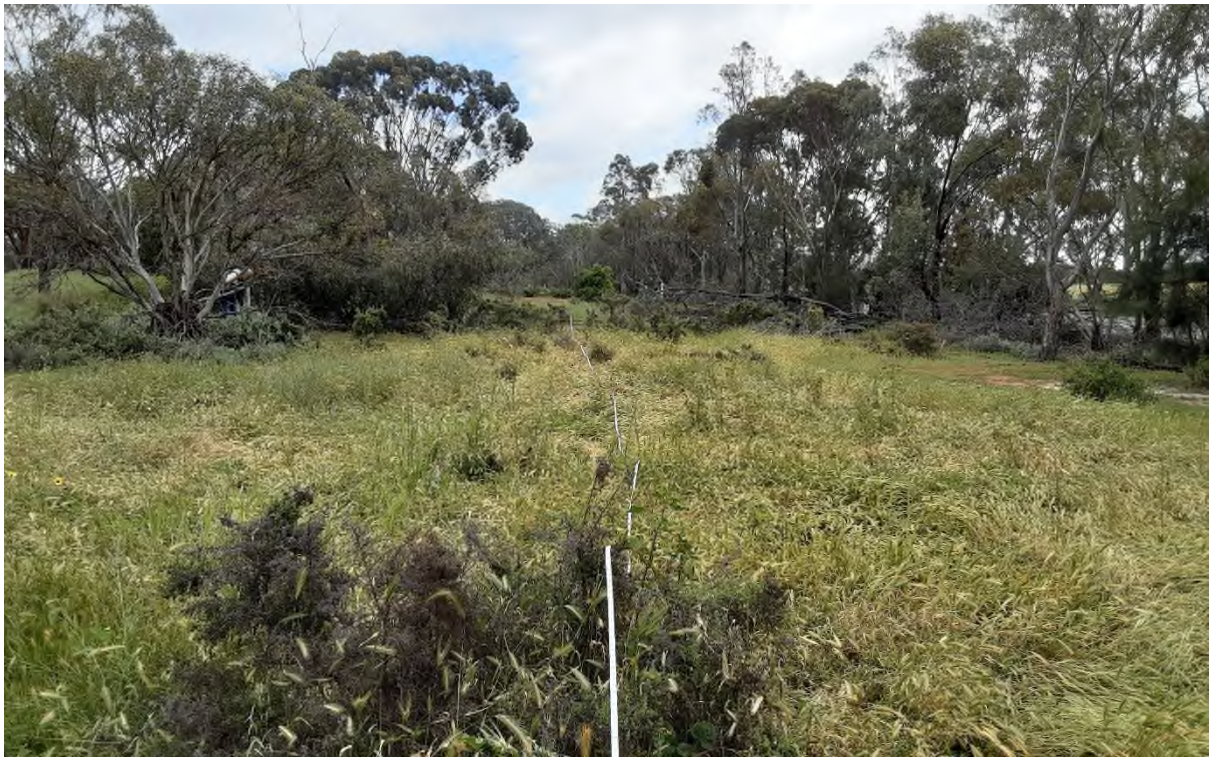
BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	<Table 2222>
		☐ Table of threatened species requiring offset and the number of species credits required	<Table 23>
		Data	
		☒ Submitted proposal in the BAM Calculator	–
Biodiversity credit report	Chapter 10	**Information**	
		☒ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	<Table 2626 & Table 2727>
		☒ BAM credit report in pdf format	<Appendix E>
		Maps and tables	
		☒ Table of credit class and matching credit profile	<Table 27>
		Data	
		☒ BAM credit report in pdf format	<Appendix E>

A.2 Decision-making key for planted vegetation

1. Does the planted native vegetation occur within an area that contains a mosaic of planted and remnant native vegetation and which can be reasonably assigned to a PCT known to occur in the same IBRA subregion as the proposal?
i. Yes .... The planted native vegetation must be allocated to the best-fit PCT and the BAM must be applied. Yes, for a small sector subsequently determined to fit to some extent with PCT 10
ii. No ..... Go to 2. No for the remainder of the vegetation, particularly one sector supporting stands of Swamp Oak
2. Is the planted native vegetation:
a. planted for the purpose of environmental rehabilitation or restoration under an existing conservation obligation listed in BAM Section 11.9(2.), and
b. the primary objective was to replace or regenerate a plant community type or a threatened plant species population or its habitat?
i. Yes .... The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.
ii. No ..... Go to 3. No
3. Is the planted/translocated native vegetation individuals of a threatened species or other native species planted/translocated for the purpose of providing threatened species habitat under one of the following:
a. a species recovery project
b. Saving our Species project
c. other types of government funded restoration project
d. condition of consent for a development approval that required those species to be planted or translocated for the purpose of providing threatened species habitat
e. legal obligation as part of a condition or ruling of court. This includes regulatory directed or ordered remedial plantings (e.g. Remediation Order for clearing without consent issued under the BC Act or the Native Vegetation Act)
f. ecological rehabilitation to re-establish a PCT or TEC that was, or is carried out under a mine operations plan, or
g. approved vegetation management plan (e.g. as required as part of a Controlled Activity Approval for works on waterfront land under the NSW Water Management Act 2000)?
i. Yes .... The planted native vegetation must be assessed in accordance with Chapters 4 and 5 of the BAM.
ii. No ..... Go to 4. No
4. Was the planted native vegetation (including individuals of a threatened flora species) undertaken voluntarily for revegetation, environmental rehabilitation or restoration without a legal obligation to secure or provide for management of the native vegetation?
i. Yes ..... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).
ii. No ..... Go to 5. No
5. Is the native vegetation (including individuals of a threatened flora species) planted for functional, aesthetic, horticultural or plantation forestry purposes? This includes examples such as: windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or teatree farms?
i. Yes .... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied). Yes
ii. No ..... Go to 6.
6. Is the planted native vegetation a species listed as a widely cultivated native species on a list approved by the Secretary of the Department (or an officer authorised by the Secretary)?
i. Yes .... Go to D.2 Assessment of planted native vegetation for threatened species habitat (the use of Chapters 4 and 5 of the BAM are not required to be applied).

ii. No ..... There may be other types of occurrences of planted native vegetation that do not easily fit into the decision-making key above. Assessors should contact the BAM Support mailbox at bam.support@environment.nsw.gov.au for further advice on using the BAM to assess other types of occurrences of planted native vegetation.

Appendix B: Site Photographs



Photograph B1 BAM Plot BAM Plot 1 with non-native trees in centre left and dense exotic grass cover. Scattered clumps of native *Maireana* spp. and weeds are also evident

Photograph B2 BAM Plot 2 with stands of planted Swamp Oaks and extensive bare ground

Photograph B3 BAM Plot 3 showing non-native tree species, bare ground, exotic grasses and scattered native shrubs

Photograph B4 BAM Plot 4, with mature Black Box in foreground and scattered naïve Chenopod shrubs

Photograph B5 **Non-native plant species in immediate vicinity of BAM Plot 3**

Photograph B6 **Disturbed areas in north of development site**

Photograph B7 **Extensive disturbance from track development in vicinity of BAM Plot 4**

Photograph B8 **Substantial ground disturbance from rabbits and young weed growth**

Photograph B9 **Portion of North-east corner of site showing roadside fence and some roadside vegetation, with extensive weed growth in foreground (photo J. Monahan)**

Photograph B10 **PCT 19 along roadside with Cypress Pine (photo J. Monahan)**

Appendix C: Matters of national environmental significance

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 08-Aug-2023

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	28
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	5
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity
Banrock station wetland complex	300 - 400km upstream from Ramsar site
Hattah-kulkyne lakes	100 - 150km upstream from Ramsar site
Riverland	200 - 300km upstream from Ramsar site
The coorong, and lakes alexandrina and albert wetland	300 - 400km upstream from Ramsar site

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community may occur within area
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions	Critically Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Lophochroa leadbeateri leadbeateri Major Mitchell's Cockatoo (eastern), Eastern Major Mitchell's Cockatoo [82926]	Endangered	Species or species habitat likely to occur within area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area
Polytelis anthopeplus monarchoides Regent Parrot (eastern) [59612]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area
FISH		
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat likely to occur within area
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
FROG		
Crinia sloanei Sloane's Froglet [59151]	Endangered	Species or species habitat may occur within area
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
MAMMAL		

Scientific Name	Threatened Category	Presence Text
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat may occur within area
PLANT		
Austrostipa metatoris		
[66704]	Vulnerable	Species or species habitat may occur within area
Lepidium monoplocoides		
Winged Pepper-cress [9190]	Endangered	Species or species habitat likely to occur within area
Maireana cheelii		
Chariot Wheels [8008]	Vulnerable	Species or species habitat likely to occur within area
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat may occur within area
Swainsona pyrophila		
Yellow Swainson-pea [56344]	Vulnerable	Species or species habitat may occur within area
REPTILE		
Hemiaspis damelii		
Grey Snake [1179]	Endangered	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area

Extra Information

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
The Modified Operation of the Goulburn Murray Irrigation District	2009/5123	Controlled Action	Post-Approval
Not controlled action			
Cannie Ridge Pipeline Project	2004/1341	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Not controlled action (particular manner)			
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix D: Vegetation survey data

BAM Vegetation Plot- Field Survey Form							General Location	
Survey Name	Murray Downs			**Zone ID**		**Recorders**		
Date:	17/09/22			3		Alison Martin		
Zone	**Datum**		**Plot ID:**	MDBAM 1		**Plot dimensions:**		20 x 50 m
54	GDA 94							
Easting	**Northing**		**IBRA region:**	Murray Fan		**Midline bearing from 0m:**		85
736721	6085349							
Vegetation Class:							**Confidence (H, M, L):**	
Plant Community Type:		Planted - not representative of a PCT			**EEC:**	No	**Confidence (H, M, L):**	

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute ($400m^2$ plot)		Sum values
Count of **Native Richness**	**Trees**	0
	Shrubs	3
	Grasses etc.	0
	Forbs	0
	Ferns	0
	Other	0
Sum of **Cover** of native vascular plants by growth form group	**Trees**	0
	Shrubs	4
	Grasses etc.	0
	Forbs	0
	Ferns	0
	Other	0
Hight Threat Weed cover		2

BAM Attribute ($1000m^2$ plot)		
DBH	**Tree Stems Cour**	**# of Hollow Bearing Trees**
80 + cm		0
50 - 79 cm		
30 - 49 cm		
20 - 29 cm		
10 - 19 cm	1	
5 - 9 cm		
< 5 cm	1	
Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	0.5	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Atttribute (1 x 1 m plots)	Litter Cover (%)				
Subplot score (% in each)	5%	10%	40%	40%	15%
Average of the 5 subplots	22%				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter). Assessors may also record the cover of rock, bare ground and cryptograms.

400m^2 plot: Sheet 2 of 2		Survey Name	Plot Identifier	Recorders
Date:	17/09/2022	Murray Downs	MDBAM 1	Alison Martin

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E, or HTE	Cover	Stratum	Common Name
TG (Trees)					
		0	0		
SG (Shrubs	*Maireana* sp.	1	2	U	Saltbush
	Maireana brevifolia	1	1	U	Saltbush
	Acacia sp.	1	1	U	Wattle
		3	4		
FG (Forbs					
		0	**0**		
GG (Grass & Grasslike)					
		0	**0**		
EG (Ferns)					
		0	0		
OG (Other)					
		0	**0**		
EXOTICS	*Gazania spp. (HTE* if *G. rigens)*	1	2		Treasure flower
Hight Threat Weeds					
			2		
Other weeds	*Bromus cathaticus*	1	70		Prairie Grass
	Grass sp.	1	0.01		
	Lavandula stoechas	1	0.1		Lavender weed
	Trifolium spp.	1	10		Medic weed
	Malva parviflora	1	1		Marshmallow weed
	Rapistrum rugosum	1	1		Turnip weed
	Sonchus spp.	1	0.1		Sow thistle
	Chondrilla juncea	1	2		Skeleton weed
		8	**84.21**		

BAM Vegetation Plot- Field Survey Form	General Location	Golf club land beside creek

Survey Name	Murray Downs		Zone ID	Recorders	
Date:	17/09/22		2	Alison Martin	
Zone	Datum	Plot ID:	MDBAM 2	Plot dimensions:	20 x 50 m
54	GDA 94				
Easting	Northing	IBRA region:	Murray Fan	Midline bearing from 0m:	159
736750	6085324				
Vegetation Class:				L):	
Plant Community Type:	Planted	EEC:	No	Confidence (H, M, L):	

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400m² plot)		Sum values
Count of **Native Richness**	**Trees**	
	Shrubs	3
	Grasses etc.	1
	Forbs	0
	Ferns	0
	Other	0
Sum of **Cover** of native vascular plants by growth form group	**Trees**	40
	Shrubs	9
	Grasses etc.	0.1
	Forbs	2
	Ferns	0
	Other	0
Hight Threat Weed cover		0

BAM Attribute (1000m² plot)		
DBH	**Tree Stems Cour**	**# of Hollow Bearing Trees**
80 + cm		0
50 - 79 cm		
30 - 49 cm	2	
20 - 29 cm	7	
10 - 19 cm	17	
5 - 9 cm	1	
< 5 cm	41	
Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	0	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**
For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Atttribute (1 x 1 m plots)	Litter Cover (%)				
Subplot score (% in each)	50%	98%	65%	97%	98%
Average of the 5 subplots	82%				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter). Assessors may also record the cover of rock, bare ground and cryptograms.

400m^2 plot: Sheet 2 of 3		Survey Name	Plot Identifier	Recorders
Date:	17/09/2022	Murray Downs	MDBAM 2	Alison Martin

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E, or HTE	Cover	Stratum	Common Name
TG (Trees)	*Casuarina glauca*	PI	40	C	Swamp oak
	Eucalyptus sargentii	PI	5	C	Salt River Gum
			45		
SG (Shrubs	*Maireana brevifolia*	1	3	U	Saltbush
	Chenopodium s curvispicatum?	1	5	U	
	Enchylaena curvispicatum	1	1	U	Ruby Saltbush
		3	9		
FG (Forbs	Small unidentieid sp.	1	2	G	
		0	**2**		
GG (Grass & Grasslike)					
	Tripogon loliiformis	1	0.1	G	Five minute grass
		1	**0.1**		
EG (Ferns)					
		0	0		
OG (Other)					
		0	**0**		
EXOTICS					Treasure flower
High Threat Weeds					
		HTW	**0**		
Other weeds	*Bromus catharticus*		0.01	G	Prairie Grass
	Trifolium spp.		5	G	Medic weed
	Malva parviflora		0.01	G	Marshmallow weed
	Rapistrum rugosum		0.01	G	Turnip weed
	Sonchus spp.		0.01	G	Sow thistle
	Onopordum spp.		0.01	G	Thistle
	Unidentified sp.		0.01	G	
			5.06		

BAM Vegetation Plot- Field Survey Form					General Location	West end of site near houses
Survey Name	Murray Downs		**Zone ID**		**Recorders**	
Date:	17/09/22				Alison Martin	
Zone	**Datum**	**Plot ID:**	MDBAM 3		**Plot dimensions:**	
54	GDA 94					
Easting	**Northing**	**IBRA region:**			**Midline bearing from 0m:**	
736515	6085496					
Vegetation Class:						**Confidence (H, M, L):**
Plant Community Type:				**EEC:**		**Confidence (H, M, L):**

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400m^2 plot)		Sum values
Count of **Native Richness**	**Trees**	
	Shrubs	21
	Grasses etc.	2
	Forbs	0
	Ferns	0
	Other	0
Sum of **Cover** of native vascular plants by growth form group	**Trees**	5
	Shrubs	21
	Grasses etc.	2
	Forbs	0
	Ferns	0
	Other	0
Hight Threat Weed cover		0.01

BAM Attribute (1000m^2 plot)		
DBH	**Tree Stems Cour**	**# of Hollow Bearing Trees**
80 + cm		0
50 - 79 cm		
30 - 49 cm		
20 - 29 cm	3	
10 - 19 cm	0	
5 - 9 cm	1	
< 5 cm	X	
Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	4	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Atttribute (1 x 1 m plots)	Litter Cover (%)				
Subplot score (% in each)	50%	40%	5%	2%	10%
Average of the 5 subplots	21%				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter). Assessors may also record the cover of rock, bare ground and cryptograms.

400m² plot: Sheet 2 of 3		Survey Name	Plot Identifier	Recorders
Date:	17/09/2022	Murray Downs	MDBAM 3	Alison Martin

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E, or HTE	Cover	stratum	Common name
TG (Trees)	*Casuarina glauca*	PI	5	C	Swamp Oak
	Eucalyptus ficifolia?	PI	5	C	
			10		
SG (Shrubs	*Maireana brevifolia*	1	15	U	Saltbush
	Maireana sp	1	5	U	Saltbush
	Chenopodium s curvispicatum?	1	1	U	
		3	21		
FG (Forbs					
			0		
GG (Grass & Grasslike	Specimen J	1	10	G	
	Tripogon loliiformis	1	2	G	Five minute grass
		2	**2**		
EG (Ferns)					
			0		
OG (Other)					
			0		
EXOTICS	*Gazania spp. (HTE if G. rigens)*	1	0.01		Treasure flower
Hught Threat Weeds					
			0.01		
Other weeds	*Bromus catharticus*		**3**	G	Prairie Grass
	Hordeum leporinum		0.01	G	Wall Barley
	Trifolium spp.		0.01	G	Medic weed
	Malva parviflora		0.01	G	Marshmallow weed
	Rapistrum rugosum		3	G	Turnip weed
	Sonchus spp.		0.01	G	Sow thistle
	Succulent sp.		0.01	G	
	Soliva sp/		1	G	
			7.05		

BAM Vegetation Plot- Field Survey Form	General Location	Adjacent to gold club boundary to W of residences

Survey Name	Murray Downs		Zone ID	Recorders	
Date:	17/09/22		1	Alison Martin	
Zone	Datum	Plot ID:	MDBAM 4	Plot dimensions:	20 x 50 m
54	GDA 94				
Easting	Northing	IBRA region:	Murray Fan	Midline bearing from 0m:	295
736479	6085353				
Vegetation Class:		Inland Riverine Forests			Confidence (H, M, L):
Plant Community Type:		PCT 10	EEC:	No	Confidence (H, M, L):

Record easting and northing at 0m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400m^2 plot)		Sum values
Count of **Native Richness**	**Trees**	2
	Shrubs	6
	Grasses etc.	1
	Forbs	0
	Ferns	0
	Other	0
Sum of **Cover** of native vascular plants by growth form group	**Trees**	25
	Shrubs	31
	Grasses etc.	1
	Forbs	0
	Ferns	0
	Other	0
Hight Threat Weed cover		0

BAM Attribute (1000m^2 plot)		
DBH	**Tree Stems Cour**	**# of Hollow Bearing Trees**
80 + cm		0
50 - 79 cm	1	
30 - 49 cm	1	
20 - 29 cm	2	
10 - 19 cm	11	
5 - 9 cm	8	
< 5 cm	28	
Length of logs (m) (≥ 10 cm diameter, > 50 cm in length)	11	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Atttribute (1 x 1 m plots)	Litter Cover (%)				
Subplot score (% in each)	50%	60%	50%	70%	98%
Average of the 5 subplots	66%				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10cm in diameter). Assessors may also record the cover of rock, bare ground and cryptograms.

400m² plot: Sheet 2 of 3		Survey Name	Plot Identifier	Recorders
Date:	17/09/2022	Murray Downs	MDBAM 4	Alison Martin

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E, or HTE	Cover	Stratum	Common Name
TG (Trees)	*Eucalyptus largiflorens*	1	20	C	Black Box
	Eucalyptus sargentii (Planted)			M	
	Eucalyptus camaldulensis	1	5	C	River Red Gum
		2	25		
	Melaleuca lanceolata?	1	5	M	Paperbark
SG (Shrubs	*Maireana sp.*	1	10	U	Saltbush
	Maireana brevifolius	1	3	U	Saltbush
	Enchylaena tomentosum	1	1	U	
	Melaleuca sp.	1	2	M	Paperbark
	Chenopodium sp.	1	10	U	
		6	31		
FG (Forbs					
		0	**0**		
GG (Grass & Grasslike	*Tripogon loliiformis*	1	1	G	Five minute grass
		1	**1**		
EG (Ferns)					
		0	0		
OG (Other)					
		0	**0**		
EXOTICS					
Hught Threat Weeds					
		HTW	**0**		
Other weeds	*Utica* sp.		1	G	
	Rapistrum rugosum		1	G	Turnip weed
	Sonchus sp.		0.01	G	Sow thistle
			2.01		

Appendix E: Credit reports

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00041847/BAAS18002/23/00041848	The Sixteenth Pty Ltd Residential Development Murray Downs Drive Murray Downs-New South Wales	22/06/2023
Assessor Name	**Report Created**	**BAM Data version ***
Alison Martin	29/12/2023	61
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18002	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
0	29/12/2023	BOS Threshold: Biodiversity Values Map

* 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.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	10_Moderate	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Moderate	0.21	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00041847/BAAS18002/23/00041848	The Sixteenth Pty Ltd Residential Development Murray Downs Drive Murray Downs-New South Wales	22/06/2023
Assessor Name	**Report Created**	**BAM Data version ***
Alison Martin	29/12/2023	61
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18002	Part 4 Developments (General)	Finalised
Assessment Revision	**BOS entry trigger**	**Date Finalised**
0	BOS Threshold: Biodiversity Values Map	29/12/2023

* 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.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australian Painted Snipe	Rostratula australis	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Barking Owl	Ninox connivens	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Black Falcon	Falco subniger	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Black-breasted Buzzard	Hamirostra melanosternon	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Brolga	Grus rubicunda	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Diamond Firetail	Stagonopleura guttata	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Dusky Woodswallow	Artamus cyanopterus cyanopterus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Freckled Duck	Stictonetta naevosa	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Gilbert's Whistler	Pachycephala inornata	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Little Eagle	Hieraaetus morphnoides	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Little Pied Bat	Chalinolobus picatus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Major Mitchell's Cockatoo	Lophochroa leadbeateri	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Masked Owl	Tyto novaehollandiae	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Painted Honeyeater	Grantiella picta	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Pied Honeyeater	Certhionyx variegatus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Spotted Harrier	Circus assimilis	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Square-tailed Kite	Lophoictinia isura	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Superb Parrot	Polytelis swainsonii	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Swift Parrot	Lathamus discolor	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Varied Sittella	Daphoenositta chrysoptera	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
White-bellied Sea-Eagle	Haliaeetus leucogaster	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Australasian Bittern	Botaurus poiciloptilus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Corben's Long-eared Bat	Nyctophilus corbeni	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Grey Falcon	Falco hypoleucos	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Purple-crowned Lorikeet	Glossopsitta porphyrocephala	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
Regent Parrot (eastern subspecies)	Polytelis anthopeplus monarchoides	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
White-throated Needletail	Hirundapus caudacutus	10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

BAM Predicted Species Report

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Australasian Bittern	Botaurus poiciloptilus	Habitat constraints
Corben's Long-eared Bat	Nyctophilus corbeni	Species is vagrant
Grey Falcon	Falco hypoleucos	Species is vagrant
Purple-crowned Lorikeet	Glossopsitta porphyrocephala	Species is vagrant
Regent Parrot (eastern subspecies)	Polytelis anthopeplus monarchoides	Refer to BAR
White-throated Needletail	Hirundapus caudacutus	Refer to BAR

BAM Candidate Species Report

Proposal Details

Assessment Id 00041847/BAAS18002/23/00041848	Proposal Name The Sixteenth Pty Ltd Residential Development Murray Downs Drive Murray Downs-New South Wales	BAM data last updated * 22/06/2023
Assessor Name Alison Martin	Report Created 29/12/2023	BAM Data version * 61
Assessor Number BAAS18002	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 0	Date Finalised 29/12/2023	BOS entry trigger BOS Threshold: Biodiversity Values Map

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Black-breasted Buzzard	Hamirostra melanosternon	Habitat constraints
Bush Stone-curlew	Burhinus grallarius	Habitat degraded
Major Mitchell's Cockatoo	Lophochroa leadbeateri	Habitat constraints
Masked Owl	Tyto novaehollandiae	Habitat constraints
Regent Parrot (eastern subspecies)	Polytelis anthopeplus monarchoides	Habitat constraints
Southern Bell Frog	Litoria raniformis	Habitat degraded
Squirrel Glider	Petaurus norfolcensis	Habitat degraded

Superb Parrot	Polytelis swainsonii	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00041847/BAAS18002/23/00041848	The Sixteenth Pty Ltd Residential Development Murray Downs Drive Murray Downs-New South Wales	22/06/2023
Assessor Name	**Report Created**	**BAM Data version ***
Alison Martin	29/12/2023	61
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS18002	Finalised	29/12/2023
Assessment Revision	**Assessment Type**	**BOS entry trigger**
0	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

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Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
1	10_Moderate	Not a TEC	30.3	30.3	0.21	PCT Cleared - 43%	High Sensitivity to Gain			1.50		2
											Subtotal	**2**
											Total	**2**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Myotis macropus / Southern Myotis (Fauna)									
10_Moderate	30.3	30.3	0.21	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	3
								Subtotal	**3**
Phascolarctos cinereus / Koala (Fauna)									
10_Moderate	30.3	30.3	0.21	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	3
								Subtotal	**3**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00041847/BAAS18002/23/00041848

Proposal Name
The Sixteenth Pty Ltd Residential Development Murray Downs Drive Murray Downs-New South Wales

BAM data last updated *
22/06/2023

Assessor Name
Alison Martin

Assessor Number
BAAS18002

BAM Data version *
61

Proponent Names

Report Created
29/12/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
29/12/2023

BOS entry trigger
BOS Threshold: Biodiversity Values Map

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Botaurus poiciloptilus / Australasian Bittern
Falco hypoleucos / Grey Falcon
Glossopsitta porphyrocephala / Purple-crowned Lorikeet
Nyctophilus corbeni / Corben's Long-eared Bat
Polytelis anthopeplus monarchoides / Regent Parrot (eastern subspecies)
Hirundapus caudacutus / White-throated Needletail

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

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	0.2	0	2	2

10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362, 4088, 4089	Inland Riverine Forests <50%	10_Moderate	No	2	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**10_Moderate**	0.2	3.00
Phascolarctos cinereus / Koala	**10_Moderate**	0.2	3.00

BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00041847/BAAS18002/23/00041848

Proposal Name

The Sixteenth Pty Ltd Residential Development Murray Downs Drive Murray Downs-New South Wales

BAM data last updated *

22/06/2023

Assessor Name

Alison Martin

Assessor Number

BAAS18002

BAM Data version *

61

Proponent Name(s)

Report Created

29/12/2023

BAM Case Status

Finalised

Assessment Revision

0

Assessment Type

Part 4 Developments (General)

Date Finalised

29/12/2023

BOS entry trigger

BOS Threshold: Biodiversity Values Map

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Nil		

Additional Information for Approval

PCT Outside Ibra Added

None added

BAM Biodiversity Credit Report (Variations)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Botaurus poiciloptilus / Australasian Bittern
Falco hypoleucos / Grey Falcon
Glossopsitta porphyrocephala / Purple-crowned Lorikeet
Nyctophilus corbeni / Corben's Long-eared Bat
Polytelis anthopeplus monarchoides / Regent Parrot (eastern subspecies)
Hirundapus caudacutus / White-throated Needletail

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
10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	Not a TEC	0.2	0	2	2.00

10-River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 79, 112, 233, 234, 249, 356, 362, 4088, 4089	Inland Riverine Forests <50%	10_Moderate	No	2	Murray Fans,Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 4 or higher threat status	10_Moderate	No	2	IBRA Region: Riverina, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**10_Moderate**	0.2	3.00
Phascolarctos cinereus / Koala	**10_Moderate**	0.2	3.00

Credit Retirement Options

Like-for-like options

Myotis macropus/ Southern Myotis	Spp	IBRA region	
	Myotis macropus/Southern Myotis	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act	IBRA region

		shown below	
	Fauna	Vulnerable	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Phascolarctos cinereus/ Koala	Spp	IBRA region	
	Phascolarctos cinereus/Koala	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Murray Fans, Inland Slopes, Lower Slopes, Murrumbidgee, Robinvale Plains, South Olary Plain and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.