Biodiversity Assessment

Sandringham Netball Centre

13 February 2022

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Our Ref:

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Lisa Jegathesan, Elvira Lanham and John Harris

(Senior and Principal Ecologist Arcadis) (Wildlife & Ecology)

Prepared By:
Lisa Jegathesan
Senior Ecologist
Arcadis
Level 18, Queen & Collins Tower
376-390 Collins Street
Melbourne

William Terry

[Checker]

Senior Ecologist

Prepared For:
Amy Weir
Biodiversity and Conservation Planning Officer
Bayside City Council
76 Royal Avenue
Sandringham

Elvira Lanham

[Approver]

Principal Ecologist

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Acronyms and Abbreviations

Acronym	Definition
EPBC	*Environment Protection and Biodiversity Conservation Act 1998* (Commonwealth)
FFG	*Flora and Fauna Guarantee Act 1988* (State)
CR	Critically Endangered (EPBC)
EN	Endangered (EPBC)
MIG	Migratory (EPBC)
VU	Vulnerable (EPBC)
cr	Critically Endangered (FFG)
vu	Endangered (FFG)
en	Vulnerable (FFG)
DBH	Diameter at Breast Height
EVC	Ecological Vegetation Class
HZ	Habitat Zone
FBRHS	Friends of Bay Road Heathland Sanctuary
VBA	Victorian Biodiversity Atlas
PMST	Protected Matter Search Tool (EPBC)

Executive Summary

Bayside City Council, in conjunction with Victorian and Federal Governments, is funding the Bayside Netball Centre development at Sandringham College, located on Holloway Road in Sandringham. The centre will be located within the sports fields of the college and will comprise nine outdoor courts, three indoor courts, and an oval for community and school sport. The majority of the development and works (netball courts) will be located within the western portion of the existing sportsgrounds, with the oval in the east.

Arcadis in conjunction with Wildlife & Ecology were commissioned by Bayside Council to undertake a biodiversity assessment for the Sandringham Netball Centre project. The objectives of the project were to assess the biodiversity values within and immediately adjoining the proposed netball centre, and to determine potential biodiversity constraints, impacts and mitigation measures. This assessment included consideration of potential indirect impacts of the development to the biodiversity values within the Bay Road Heathland Sanctuary which adjoins the sports fields in the north.

A site meeting was held within the sanctuary in May 2021 with Council and the Friends of Bay Road Heathland Sanctuary, and field assessments were undertaken in September following easing of COVID restrictions. The surveys focused on the sports fields of Sandringham College where the works will be undertaken, as well as the trees on the southern boundary of the Bay Road Heathland Sanctuary.

Flora

A total of 91 vascular plant taxa were recorded during the site assessment, of which 64 (70%) taxa are introduced (i.e. not native to Victoria). No species recorded is listed as threatened under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), nor are any species listed under these acts expected to occur within the works area. A total of 199 vascular and 12 nonvascular taxa have been previously recorded from the Sanctuary (refer appendices).

The sportsgrounds are dominated by exotic vegetation. Planted vegetation comprising native and exotic trees and indigenous vegetation occurs around the perimeter of the fields. The Sanctuary supports predominately indigenous vegetation.

Three Ecological Vegetation Classes (EVCs) were recorded within the college sportsgrounds and the Sanctuary:

- EVC 6 Sand Heathland located within the Bay Road Heathland Sanctuary and is the dominant EVC of the reserve. This EVC is of moderate to high condition and supports a relatively high diversity of flora and fauna.
- EVC 48 Heathy Woodland occurs on the northern, western and southern boundaries of the sanctuary. The remnant on the southern boundary extends into the adjoining sports fields of Sandringham College. These patches are relatively narrow and support a mixture of indigenous, native (but not indigenous) and exotic species. The Heathy Woodland remnants provides a buffer to adjoining land uses.
- EVC 3 Damp Sands Herb-rich Woodland occurs as four small modified patches along the eastern and southern boundary of the sports fields. The patches largely comprised an indigenous canopy, scattered understorey trees and shrubs and a ground layer dominated by exotic grasses. Trees not indigenous to the EVC have also been planted amongst these remnants.

No ecological communities listed under the EPBC Act or FFG Act occur within the study area.

Fauna

Twenty-eight (28) vertebrate species were recorded during the site assessment and site meeting – this comprised 22 bird species (four introduced) and six mammals (two introduced). One species recorded, Grey-headed Flying Fox is listed under the EPBC Act and FFG Act. It was observed flying over the site during the site survey. The Grey-headed Flying Fox species and the Swift Parrot (EPBC, FFG) may occasionally forage within the study area when nectar producing trees and shrubs are in flower. The Grey Goshawk (FFG) and Common Bent-wing Bat (FFG) may also hunt for prey within and above the study area.

The most notable habitat within the sportsgrounds were the trees along the boundaries of the sports fields. A number of active Eastern Ring-tailed Possum *Psudocheirus peregrinus* dreys and recently used bird's nests were found within these trees during the survey. Some of the larger trees may also provide nesting hollows or shelter for other fauna such as parrots and reptiles.

Eleven bird species were recorded from the sports fields within the college. The majority of these birds are considered generalist in terms of habitat requirements. All six mammal species recorded were observed during the surveys of the sportsgrounds. Eastern Ring-tailed Possums and Common Brush-tailed Possums, *Trichosurus vulpecula* were recorded from the trees along the boundary of the sports fields. Grey-headed Flying Fox *Pteropus poliocephalus* and White-striped Freetail Bat *Austronomus australis* were observed flying over the sports fields during the spotlight survey.

Dense foliage and the diversity of shrub species within the Bay Road Heathland Sanctuary provide abundant nesting and foraging resources and protection from predation, especially for smaller bush birds. A total of 21 bird species were recorded during the current survey; 80 species have been previously recorded from the reserve. Eastern Ring-tailed Possum dreys were found in the denser, taller shrubs and amongst the mistletoes of trees along the walking track. The sandy soils and abundant leaf litter within the reserve provides habitat for reptiles and numerous invertebrate species. The heathland has a particularly high diversity of insects, with 322 species previously recorded from the site to date (refer appendices for list).

Potential impacts

The current development plan avoids the removal of indigenous vegetation, including impacts to Tree Protection Zones (TPZs). The majority of the planted trees and their associated TPZs are also avoided, including the new carpark and associated entry and exit points. Some planted trees in the western portion of the site will require removal. Any removal of vegetation from the sports precinct area including trees, is not considered likely to have a significant impact on any threatened species, including the Grey-headed Flying-fox, Swift Parrot, White-throated Needletail, Grey Goshawk or Common Bent-wing Bat.

Key issues for the project in relation to protecting biodiversity values include: noise pollution, artificial light pollution, weed invasion, construction works, landscaping and user-related impacts. Potential mitigation measures to be considered for the project is provided within this report. A Construction Environmental Management Plan that addresses weed management, fauna salvage from vegetation requiring removal, and vegetation protection fencing is recommended for the project.

1 Introduction

Arcadis in conjunction with Wildlife & Ecology were commissioned by Bayside Council to undertake a biodiversity assessment for the Sandringham Netball Centre project. The netball centre is to be located within the sportsgrounds Sandringham Secondary College along Holloway Road in Sandringham. This site is currently used for sporting events and school activities. The Bay Road Heathland Sanctuary adjoins the site in the north, the college buildings to the west and residential and mixed-use north and east (Figure 1-1). Following a consultation period with the community, concerns were raised about potential impacts to biodiversity within the Sanctuary, particularly in relation to light and noise.

The objectives of the project are to assess the biodiversity values within and immediately adjoining the proposed netball centre, and to determine potential biodiversity constraints, impacts and mitigation measures.

The study area for the project includes the sportsgrounds within Sandringham College and the adjoining Sanctuary and is c. 6.5 hectares in total (Figure 1). The 'project area' includes the sports fields and the southern boundary of the Bay Road Heathland Sanctuary, which was the focus of the assessment (Figure 1). The sports fields are zoned Public Use Zone Schedule 2 (PUZ2) and the Sanctuary Public Conservation and Resource Zone (PCRZ). Both land parcels are subject to a Design and Development Overlay (DDO2) and Development Contributions Plan Overlay (DCPO1). The Sanctuary is also affected by a Vegetation Protection Overlay (VPO2).

Current plans for the centre include:

- Three indoor courts, nine outdoor courts including change rooms and administrative facilities.
- An oval for community cricket and school sport
- 92 parking spaces
- Landscaping and planting using indigenous plants and trees
- Five-star energy initiatives including solar power, recycled materials, natural light and rainwater retention systems.

Figure 1 Sandringham Netball Centre – study area for the biodiversity assessment in blue and project area (brown line) (aerial from DELWP 2021d)

1.1 Background - Heathlands and Bay Road Heathland Sanctuary

In Australia, healthlands are diverse vegetation communities with a wide climatic range, characterised by the dominance of sclerophyllous[1] shrubs, forbs and sedges less than two metres tall. Heathlands are located on nutrient poor soils, particularly low in nitrogen and phosphorus. The landscapes in which they occur are often subject to high radiation and exposure to wind (DoEE 2017). Heathland flora has a high level of local endemism (Lindenmayer et al. 2014). They are also characterised by large numbers of invertebrate species, and of the vertebrate fauna, many birds and small mammals feeds on the nectar readily produced by many of the heathland shrubs (Lindenmayer et al. 2014).

The heathlands south-east of Melbourne were historically well known to be very species rich, particularly in ericoid shrubs, wattles, peas and orchids (Willis 1966). The threat of urbanisation on Sandringham's flora was identified early by Sutton (1911). Specifically in relation to heathlands, Willis (1966) noted that "*unfortunately this very attractive belt of vegetation, so interesting to the botanist, has been all but exterminated through suburban housing, draining of swamps and agricultural developments. The few inadequate and pathetic selvages that remain are being inexorably ruined by aggressive weeds that thrive on disturbed ground (e.g., alien species of Briza, Ehrharta, Watsonia, Phytolacca, Oxalis, Salpichroa, Coprosma, Senecio and Chrysanthemoides"*. Willis also recognised the coastal dune shrub Coast Teatree (*Leptospermum laevigatum*) was invading the heathlands and significantly reducing species composition.

Fire maintains the diversity and structure of heathlands, and plant species indigenous to heathlands are typically well adapted to fire (Shackelford et al. 2015). The absence of fire results in the invasion and dominance of scrub species like Coast Teatree, which are not indigenous to the Sand Heathland Ecological Vegetation Class (Ecology Australia 2012). When there is an apparent loss of plant species as a result of heath turning into scrub, many species are be able to persist in relatively long-lived seed banks, and fire

[1] sclerophyllous = hard leaved

stimulates germination in these species (Bargmann and Kirkpatrick 2015, Shackleford et al 2015). Coast Teatree is killed by fire and recruitment is only from canopy stored seed, as such fire is useful management tool for heathland communities.

Located on Neogene sand deposits (old dune sands), the 2 ha Bay Road Heathland Sanctuary is the closest heathland remnant to Melbourne. Council (then Sandringham Council) purchased the land at Bay Road in 1939 (Fletcher 1988). The site was already well known for its botanical values, and when plans for development of the site was put forward by Council, a petition resulted in the rezoning request being withdrawn; the reserve was formerly established in 1976 (Fletcher 1988). Historic aerial photos (Figure 2) indicates that the site was relatively undisturbed in 1945; the poor-quality soils were not useful for agricultural or horticultural purposes.

The Bay Road Heathland has been well managed by the Council's Bushland Crew (Citywide) and Friends of Bay Road Heathland Sanctuary (FoBRHS). The majority of the reserve supports Sand Heath and is of moderate to high quality. Modified Heathy Woodland occurs on the western and southern boundaries (Ecology Australia 2008) and comprises a mix of indigenous and planted native (but not indigenous) trees. The Woodland acts as a buffer to neighbouring properties and Bay Road. Fire has been recently used as a management tool to successfully stimulate germination of soil stored seed and remove Coast Teatree from the majority of the reserve. Combined with supplementary indigenous plantings, weed management and control of other 'out of balance' native species, this small reserve now supports a relatively high diversity of flora and fauna. A total of 472 native fauna largely comprising invertebrates, and 148 native plant taxa, have been recorded within the reserve (Table 1 and Table 2).

Table 1 Breakdown fauna taxa records for Bay Road Heathland Sanctuary[2]

Group	Native	Introduced	Total
Invertebrates	**389**	**8**	**397**
Insects	316	6	322
Arachnids	67	0	67
Chilopods	2	0	2
Diplopods	1	1	2
Malacostracans	1	0	1
Collembola	2	0	2
Gastropods	0	1	1
Vertebrates	**83**	**12**	**95**
Mammals	8	1	9
Birds	69	11	80
Reptiles	5	0	5
Amphibians	1	0	1
Total	**472**	**20**	**492**

[2] Data from Victorian Biodiversity Atlas, iNaturalist, and Friends of Bay Road Heathland Sanctuary (Appendix A and B)

Table 1 Breakdown of flora taxa records for Bay Road Heathland Sanctuary[2]

Group	Native	Introduced	Total
Non-vascular	**11**	**1**	**12**
Mosses	6	1	7
Liverworts	2	0	2
Lichens	2	0	2
Fungi	1	0	1
Vascular	**137**	**62**	**199**
Ferns	2	0	2
Monocots	46	21	67
Dicots	89	41	130
Total	**148**	**63**	**211**

Figure 1 Bay Road Sandringham 1945, showing location of Heathland Sanctuary (orange outline; from DELWP 2021e)

Considerations for potential indirect impacts to heathlands and associated wildlife from development include:

- Nutrient enrichment – can occur from runoff upslope e.g. roads or adjoining properties (Lindenmayer et al. 2014), as well from domestic animals (faeces).
- Weed invasions – weed propagules from adjoining properties establish within the heathland. Propagules can be dispersed via wind, animals and water (run-off). If coupled with nutrient enrichment, weed species can proliferate in nutrient poor heathlands and result in loss (cover and abundance) of indigenous flora (Lindenmayer et al. 2014).
- Plant pathogens – adjoining developments can bring in plant pathogens which can be dispersed by movement of soil and/or water. Of particular interest to heathlands is the exotic water mould

Cinnamon Fungus *Phytophthora cinnamomi.* Many indigenous flora of heathlands are vulnerable to this fungus i.e. flora from the Proteaceae, Fabaceae, Epacridaceae, and Myrtaceae families.

- Light pollution – impacts of artificial light (including light spill) on wildlife. Artificial light at night can disrupt circadian rhythms in animals and can cause changes in animal orientation, feeding and migratory behaviour (DoEE 2020).
- Noise pollution – impacts of anthropogenic noise on wildlife can affect animal communication (e.g. calls for warnings and mating), navigation (e.g. identify obstacles or predators) and foraging (e.g. noises to determine presence of prey), and is known to affect all groups of fauna including invertebrates (Sordello et al. 2020 and Newport et al. 2014).

In relation to Bay Road Heathland Sanctuary and the proposed development, impacts relating to nutrient enrichment from run-off, or transport of plant pathogens into the sanctuary, are not anticipated due to the development site being at a lower elevation than the reserve. Weed invasions from Sandringham College into the reserve is already occurring and will need to be managed prior to works commencing and will need to be controlled on an ongoing basis. Light pollution could potentially impact wildlife within the reserve; options for lighting mitigation are reasonably well known. Much less is known about noise pollution on wildlife (*cf.* light), particularly in relation to recreational noise e.g. whistles (Newport et al. 2014).

Potential impacts and mitigation options for the current project in relation to weeds, light and noise are provided in Section 4.

2 Methods

2.1 Desktop review

Relevant databases were searched for records of significant flora and fauna species within a five-kilometre buffer on the study area. This review was used to prepare a list of flora and fauna species including threatened species, vegetation communities (Ecological Vegetation Classes) previously recorded or predicted to occur in the study area and the broader locality.

Database, mapping sources and literature reviewed included:

- Department of Environment, Land, Water and Planning (DELWP 2021a) NatureKit interactive map for Ecological Vegetation Class (EVC) mapping/modelling of the area (both extant and pre-1750)
- Flora and fauna records held in the Victorian Biodiversity Atlas (VBA) online database (DELWP 2021b)
- Records from within and adjoining the Bay Road Sanctuary lodged in the iNaturalist database (iNaturalist 2021)
- eBird Australia (eBird 2021), an on-line database maintained by The Cornell Lab of Ornithology at Cornell University, New York. This database collects observations from birders worldwide and is maintained by local partner conservation organisations. eBird provides a rich data source for basic information on bird abundance and distribution, that are rarely lodged with the VBA directly.
- Records of flora and fauna species provided by FoBRHS to Council
- Bayside Planning Scheme online (DELWP 2021c)
- Planning Maps online (DELWP 2021d)
- Review of aerial photography, including historic photomaps (DELWP 2021e)
- Relevant legislation, government policies and strategies
- Review of relevant publicly available reports for the study area and surrounds including: Native Vegetation Works Program, Stages 1 and 2 (Ecology Australia 2008 and 2012), Cheltenham Park Bat Study (Ecology Australia 2018); and Bayside Biodiversity Action Plan (Bayside 2018).

2.2 Site assessment

2.2.1 Onsite meeting

A meeting with Arcadis, Wildlife & Ecology, Council project team and representatives from the Friends of Bay Road Heathland Sanctuary was held on 7 May 2021 at the Bay Road Heathland Reserve to discuss the biodiversity values of the reserve, the proposed plans, and concerns in relation to potential impacts on biodiversity values of the reserve.

2.2.2 Flora and vegetation communities

The flora and vegetation survey focused on the sportsgrounds of Sandringham College and the trees on the southern boundary of the Bay Road Heathland Sanctuary (the project area). An overview vegetation assessment of the remaining vegetation within the Sanctuary was undertaken as this site will not be directly impacted by the works.

The vegetation assessment was undertaken on 5 November by certified Vegetation Quality Assessment (VQA) Assessors accredited by the Department of Environment, Land, Water and Planning (DELWP). Data

was recorded on GPS-enabled mobile device with Habitat Hectares recorded on VQA Assessment Sheets (DSE 2004) for each patch.
Field surveys involved:

- Assessment and mapping of native vegetation that meets the 'patch', scattered tree and large tree definitions in DELWP's *Guidelines for the Removal, Destruction or Lopping of Native Vegetation* (the Guidelines; DELWP 2017, see below)
  - Patches – mapping of Ecological Vegetation Classes (EVCs), habitat zones (areas of contiguous habitat within an EVC), Large Trees within patches. A Vegetation Quality Assessment (Habitat Hectares) was undertaken for each patch/habitat zone as per DELWP's Vegetation Condition Assessment Manual (DSE 2004) and the Guidelines (DELWP 2017)
  - Scattered Trees (remnant canopy trees) – assigned as either small or large scattered trees based on the large tree benchmark size for the relevant EVC[3].
- Mapping and measuring trees with a Diameter at Breast Height (DBH) of 20 cm or greater located within the Sandringham Secondary College playing fields.
- An assessment of the likelihood of the site to support flora and fauna species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and Victorian Flora and Fauna Guarantee (Amendment) Act 2019 (FFG Act).
- Photographs of the vegetation sampled.

2.2.2.1 The Guidelines and native vegetation

Native vegetation within the project area was categorised according to the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017), then for its EVC. Consideration was also given for the potential for native vegetation identified within the study area to be representative of an EPBC Act and/or FFG Act listed community.

Native vegetation is defined in planning schemes as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. The Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017) further classify native vegetation as a 'patch' or a 'scattered tree'.

A **patch** of native vegetation is:

- an area of vegetation where at least 25% of the total perennial understorey plant cover is native
- any area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy
- any mapped wetland included in the Current Wetlands map, available in DELWP systems and tools

Native vegetation within the study area that met the definition of a patch is referred to in this report as a Habitat Zone.

A **scattered tree** is a native canopy tree that does not form part of a patch. A canopy tree is a mature tree (i.e. is able to flower) that is greater than 3 m in height and is normally found in the upper layer of a vegetation type (EVC). That is, indigenous canopy trees that do not meet the definitions of a patch but are still considered to be native vegetation and therefore need to be assessed. Scattered trees are classified as small or large trees.

Large trees
A large tree can be either a large scattered tree or a large tree within a Habitat Zone (patch).

[3] Tree size is based on Diameter at Breast Height (DBH) of the tree trunk at 1.3m above the ground

A large tree is a native canopy tree with a Diameter at Breast Height (DBH) greater than or equal to the large tree benchmark for the relevant bioregional EVC. The DBH is determined by measuring the circumference (in centimetres) of a tree at 1.3 m above ground level.

2.2.3 Fauna and fauna habitats

The fauna survey was undertaken by experienced zoologists focussing on the reserve and the sportsgrounds of Sandringham College including the trees on the southern boundary of the sports fields, along Holloway Road. A list of vertebrate fauna was compiled during the initial project meeting on 7 May 2021 and again during the diurnal fauna survey and subsequent spotlighting for nocturnal fauna within the project area on 7 November 2021. The diurnal survey consisted of visual observations and listening for bird calls throughout the reserve and school grounds, with the aid of call playback for some species (thornbills) to confirm the species identification. Spotlight (nocturnal) surveys were undertaken on-foot, using high powered LED head torches, and focused on vegetation surrounding the sportsgrounds.

Any bird species recorded on these two occasions were added the existing Bay Road Heathland Sanctuary 'hotspot' list on eBird (eBird 2021).

The fauna habitat assessment focussed on the trees and other habitat within and adjoining the proposed netball centre, primarily the trees along the western, southern and eastern boundaries within the school grounds and those along the northern boundary which bordered or within the reserve.

2.3 Likelihood of occurrence

As with most biological assessments, the presence or absence of many threatened species cannot be definitively determined during a relative short survey timeline.

All significant flora and fauna species identified on databases as previously recorded within the vicinity of the study area were therefore subject to a 'likelihood of occurrence' assessment. The species assessed were those identified within a 5 km buffer of the study area boundary through searches on the VBA (DEWLP 2021b).

The probability that each significant species occurs within the study area was determined as being Negligible, Low, Moderate, High or Recorded, based on the criteria listed in Table 2-3.

Table 3 Likelihood of Occurrence Criteria

Likelihood of occurrence	Criteria for significant flora species	Criteria for significant fauna species
Negligible	• The study area is beyond the current known geographic range of the species. • The species is considered locally extinct. • The study area does not contain necessary landscape features and/or habitats to support the species; and/or • No previous records of the species in the local area or records of the species in the local	• The study area is beyond the current known geographic range of the species; or • The species is considered locally or regionally extinct; or • The study area does not contain necessary landscape features and/or habitats to support the species; and/or • No previous records of the species in the local area or records of the

	area (eg VBA) for more than 30 years old	species in the local area for more than 30 years
Low	Within the species natural range and: • The species has specific habitat requirements which are not present in the study area; or • Habitat within the study area is degraded; and/or • There are only limited or historical records of the species in the local area (i.e. greater than 20 years old)	Within the species natural range and: • The species has specific habitat requirements that are not present in the study area; or • Habitat within the study area is degraded; or • The species has a large home range and may occasionally utilise resources within the study area; or • The species is likely to visit occasionally or opportunistically whilst en route to more suitable sites; and/or • There are only limited or historical records of the species in the local area (i.e. greater than 20 years old)
Moderate	• Within the species natural range and potential habitat occurs within the study area which is of moderate quality and/or • Previous records of the species in the local area e.g. within the last 20 years	Within the species natural range and: • potential habitat occurs within the study area which is of moderate quality; or • The species has a large home range and the study area supports moderate quality roosting and/or breeding habitat; or • The species is likely to visit the area regularly (i.e. at least seasonally); and/or • Previous reputable records of the species in the local area e.g. within the last 20 years
High	• Within the species natural range and the study area supports good quality suitable habitat; and • Recent records (within 5 years) of the species in the local area e.g. VBA	Within the species natural range and: • the study area supports good quality suitable habitat; or • The species has a large home range and the study area supports good quality roosting and/or breeding habitat; and • Recent reputable records (within 5 years) of the species in the local area

2.4 Conservation significance

The conservation significance of species and ecological communities was determined using:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listings
- Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) listings.

Under the EPBC Act, there are key diagnostic criteria and conditions thresholds as defined by Commonwealth Threatened Species Scientific Committee (TSSC) that assist in identifying EPBC listed ecological communities. Ecological Vegetation Classes identified during a site assessment that may correspond with an EPBC Act listed community can therefore be assessed against these key diagnostic criteria, and where required, the relevant condition thresholds.

While there are no specific criteria which determine the presence of FFG Act ecological communities, an informal method of comparing site characteristics and floristics with community descriptions in the document: *Characteristics of Threatened Communities - Flora and Fauna Guarantee Act 1988* (DELWP undated). This document is used as a guide to determine the presence of FFG list communities during site assessment.

2.5 Nomenclature and taxonomy

Plant taxonomy and the use of common names follow the online Victorian Biodiversity Atlas (VBA; DELWP 2021b) and VicFlora (VicFlora 2021). For fauna, common names are generally used in the text and follow the VBA. An asterisk (*) before a plant name denotes an exotic/introduced species, and a hashtag (#) denotes native species that are also naturalised outside its natural range.

The study area supports a diversity of planted and naturalised species. In the following report indigenous flora species refers to those species that would naturally have occurred within the study area prior to European settlement, native species are those that are native to Victoria but not indigenous to the study area (mostly trees), and exotic species are those that are not native to Victoria.

2.6 Limitations

Some plant species may have been overlooked because they were inconspicuous when the survey was conducted or have been identified to genus level only due to the absence of fertile material. This may have reduced the number of plant species recorded compared to more favourable conditions, but the overall quality and significance of the vegetation could still be determined.

Fauna surveys and habitat assessments commonly fail to record all species or habitat features present in a study area due to reasons that include: survey time constraints, timing, seasonality of occurrence especially for migratory species, the obscurity of features like hollows in tall trees, regular maintenance of areas and land access issues. For these reasons it is likely that many species and some habitat features may have been missed during the assessment that was conducted over a relatively short time frame.

While there are substantial records of fauna and flora species within the 5 km buffer, it is recognised that everyone who has observed fauna and flora within the vicinity of this study area may not have uploaded their records in a form that allows for public access eg VBA, eBird or Atlas of Living Australia. It is therefore possible that more fauna and flora species have been recorded within the vicinity of the study area, or at a later date, than those that are listed in the sources used in this assessment.

3 Results – biodiversity values

3.1 Flora

Three Ecological Vegetation Classes (EVCs) were identified within the study area:

- EVC 6 Sand Heathland – which has a conservation status of rare in the Gippsland Plain Bioregion
- EVC 48 Heathy Woodland – least concern
- EVC 3 Damp Sands Herb-rich Woodland – vulnerable.

Sand Heathland was recorded in Bay Road Heathland Sanctuary (Figure 3). This EVC occurs on deep infertile sands and comprises a low, dense heathy shrub layer (Oates and Toranto 2001; refer also Section 1.1). Emergent and scattered eucalypts are sometimes present, and banksias can be common. Sand Heathland typically supports a diversity of sedges and rushes, with higher quality remnants supporting a diversity of orchids. Grasses are less frequently recorded (cover and diversity) in heathland remnants.

Heathy Woodland was mapped along the southern boundary of the Sanctuary and northern boundary of the sportsgrounds (Figure 3). It is floristically similar to Sand Heathland and Damp Sands Herb-rich Woodland. It merges into Sand Heathland where areas become well-drained, infertile and drought-stressed (Oates and Toranto 2001). Heathy Woodland is typically a low-open eucalypt dominated woodland and in the Bayside area Coast Manna Gum *Eucalyptus viminalis* subsp. *pyoriana* is the dominant canopy tree. Banksias are also a component of the canopy and ericoid shrubs dominate the understorey. Bracken (*Pteridium esculentum*) can dominate the understorey if fire is too frequent or where the understorey is regularly disturbed.

Damp Sands Herb-rich Woodland is also a eucalypt dominated woodland with Coast Manna Gum the key canopy species within Bayside (Ecology Australia 2008). An understory tree layer is often present and mostly comprises wattles. A diversity of grasses, herbs and sometimes bracken dominates the understorey. A shrub layer is also prominent and species within this EVC are similar to those associated with Sand Heathland and Heathy Woodland. Damp Sands Herb-rich Woodland occurs in close proximity to Sand Heathland within Bayside municipality (Ecology Australia 2008). It can also resemble degraded Heathy Woodland and is often found in association with this EVC in coastal areas (Oates and Toranto 2001).

The occurrence of these EVCs in the study area is discussed further below.

3.1.1 Bay Road Heathland Sanctuary

Sand Heathland covers 1.3 ha and is located in the central and eastern portion of the reserve (Ecology Australia 2008; Plate 1). Commonly recorded species include Heath Tea-tree *Leptospermum myrsinoides*, Showy Bossiaea *Bossiaea* cinerea, Common Beard Heath *Leucopogon virgatus*, Common Flatpea *Platylobium obtusangulum,* Shrub Sheaok *Allocasuarina paludosa,* Twiggy Daisy-bush *Olearia ramulosa*, Erect Guinea-flower *Hibbertia riparia* and Sandhill Sword-sedge *Lepidosperma sieberi*. The highest quality area which covers just over half of the Sand Heath remnant supports a high diversity of plant taxa, including orchids (seven species) and Small Grass-tree *Xanthorrhoea minor* subsp. *lutea*. These areas had a vegetation quality score of 62 (/100) when assessed in 2008 as part of the native vegetation works program (Stage 1, Ecology Australia 2008); limiting this score is the landscape context component (e.g. patch size and connectivity), scoring just two out of 15. In the urbanised landscape where the Sanctuary is located the landscape context score is unlikely to change. The north-eastern portion of the site had the lowest vegetation quality score of 14 in 2008. This area

has undergone significant management works including weed control and plantings and is likely to have doubled its condition score[4] since the original assessment (Plate 2).

The Heathy Woodland remnants occurs along the southern, western and north-western portion of the reserve (Ecology Australia 2008). These areas support a mixture of indigenous, native (but not indigenous) and exotic species. Whilst assigned Heath Woodland, the limited floristics for these areas does not rule out Damp Sands Herb-rich Woodland (Ecology Australia 2008). The vegetation quality scores varied between 35 and 49 (Ecology Australia 2008); the highest quality habitat zone is located on the southern boundary adjoining Sandringham College sports fields and includes large trees (Plate 3).

The Heathy Woodland within the reserve supports a mixed canopy of the indigenous Coast Manna Gum and planted eucalypts not indigenous to the EVC such as Red Gum *Eucalyptus camaldulensis* and Southern Mahogany *Eucalyptus botryoides*. The understorey is dominated by Bracken Pteridium esculentum, Black Wattle and opportunistic native species such as Seaberry Saltbush *Rhagodia candolleana* subsp. *candolleana* and Bower Spinach *Tetragonia implexicoma.* Coast Teatree which was once a prominent feature of the site is now mostly restricted to the road reserve.

Plate 1 Sand Heathland, Bay Road Heathland Sanctuary

[4] Expected increase in understorey, lack of weeds and organic matter components

Plate 2 Heathy Woodland on north-eastern boundary of Bay Road Heathland Sanctuary

Plate 3 Heathy Woodland on the southern boundary of Bay Road Heathland Sanctuary (Habitat Zone 1)

3.1.2 Sandringham College sports fields

The project area[5] supports predominately exotic vegetation and planted and remnant vegetation around the perimeter (Figure 3). A total of 91 vascular plant taxa were recorded, of which 64 (70%) taxa are introduced (not native to Victoria). No significant flora species were recorded.

Four patches of remnant vegetation were recorded along the boundary of the sports field (Figure 3). Two EVCs and five patches of remnant vegetation have been mapped – Healthy Woodland (Habitat Zone 1) and Damp Sands Herb-rich Woodland (Habitat Zones 2 – 5). These patches are modified and supported a high cover of exotic species and native plants not indigenous to the original vegetation communities e.g. Boobialla *Myoporum insulare*.

Little separates the Heathy Woodland and Damp Sands Herb-rich Woodland patches based on the remaining floristics onsite due to the high cover of weed species, planted trees and out-of-balance native plants. For consistency with the Native Vegetation Works Program project (Ecology Australia 2008 and 2012), Habitat Zone 1 which includes the Bay Road Heathland Sanctuary southern boundary has been mapped as Heathy Woodland. This patch supports an open Coast Manna Gum canopy and an understorey dominated by a mix of indigenous, native and exotic species such as Bower Spinach, Austral Bracken, Black Wattle, Panic Veldt-grass **Ehrharta erecta*, Pampas Lily-of-the-valley **Salpichroa origanifolia*, and Great Brome **Bromus diandrus*. Native trees (e.g. Red Gum and Southern Mahogany) have also be planted within this patch. Habitat Zone 1 had a Habitat (vegetation quality) Score of 46 (/100) and included nine large trees (Table 4; Plate 4).

Damp Sands Herb-rich Woodland has been assigned for the remaining remnants identified (Plates 5 – 7). This is due to the presence of species more typical of this EVC such as the tree form of Sweet Bursaria *Bursaria spinosa* var. *spinosa* (formerly known as *Bursaria spinosa* var. *macrophylla*). The canopy of these remnants support Coast Manna Gum and the understorey tree and shrub layer supports Black Wattle, Lightwood *Acacia implexa*, Sweet Bursaria, Boobialla, and Mirror Bush **Coprosma repens*. The ground flora is dominated by exotic grasses and herbs including *Panic Veldt-grass, Annual Veldt-grass **Ehrharta longiflora*, Prairie Grass **Bromus catharticus*, *Great Brome and *Pampas Lilly-of-the-valley. Damp Sands Herb-rich Woodland has a bioregional conservation status of vulnerable. Four Habitat Zones were mapped (Figure 3); Habitat Scores varied between 13 and 24 (Table 4).

Planted trees are located around the perimeter of the sports field and within some of the remnant patches (Figure 3). Many of these species have been used for plantings within a number of Council owned reserves (Ecology Australia 2012), they include: Red Gum *Eucalyptus camaldulensis* (variable provenance), Southern Mahoney *Eucalyptus botryoides*, Bald Island Marlock *Eucalyptus conferruminata*, Red Ironbark *Eucalyptus tricarpa*, Red-flowering Gum *Corymbia ficifolia*, and Sweet Hakea *Hakea drupacea*.

The sportsground itself supports exotic grasses and dicot herbs including Cape Weed **Arctotheca calendula*, Clovers (**Trifolium* spp.), Rye Grass (**Lolium perenne),* Couch **Cynodon dactylon* var. *dactylon*, Kikuyu **Cenchrus clandestinus*, and Rat-tail Grass **Sporobolus africanus*.

[5] project area includes the Sandringham College sportsgrounds and the southern boundary of the Bay Road Heathland Sanctuary (i.e. Habitat Zone 1).

Table 4 Vegetation Quality Assessment (Habitat) Scores

Habitat Zone			HZ1	HZ2	HZ3	HZ4	HZ5
Bioregion			GP	GP	GP	GP	GP
Ecological Vegetation Class			HW	DSRHW	DSRHW	DSRHW	DSRHW
		Max score					
Site Condition	Large Trees	**10**	10	9	0	10	0
	Canopy Cover	**5**	5	4	4	5	5
	Lack of Weeds	**15**	4	0	0	0	0
	Understorey	**25**	15	5	5	5	5
	Recruitment	**10**	5	0	0	0	0
	Organic Matter	**5**	3	4	4	3	3
	Logs	**5**	2	2	0	0	0
	Total Site Score	**75**	**44**	**24**	**13**	**23**	**13**
Landscape Context	Patch size	**10**	2	1	1	1	1
	Neighbourhood	**10**	0	0	0	0	0
	Distance to core	**5**	0	0	0	0	0
Habitat Score out of 100		**100**	**46**	**25**	**14**	**24**	**14**
Habitat Score (habitat points/100)		**1**	**0.46**	**0.25**	**0.14**	**0.24**	**0.14**
Number of Large Trees		**#**	9	3	0	2	0

Key:
HZ – Habitat Zone
GP – Gippsland Plain
HW – Heathy Woodland
DSHRW – Damp Sands Herb-rich Woodland

Plate 4 Heathy Woodland (Habitat Zone 1), Sandringham College side

Plate 5 Damp Sands Herb-rich Woodland (Habitat Zone 2), Sandringham College

Plate 6 Damp Sands Herb-rich Woodland (Habitat Zone 3), Sandringham College

Plate 7 Damp Sands Herb-rich Woodland (Habitat Zone 4), Sandringham College

3.2 Fauna

3.2.1 Bay Road Heathland Sanctuary

From the initial site meeting and subsequent fauna survey, a total of 21 bird species (Table 4) were recorded from within the heathland reserve. While almost half of these species could be considered generalists, the heathland community provides ideal habitat for small bush birds including White-browed Scrubwren *Sericornis frontalis,* Brown Thornbill *Acanthiza pusilla* and the smaller honeyeaters (e.g New Holland Honeyeater *Phylidonyris novaehollandiae* and White-plumed Honeyeater *Ptilotula penicillata* (Appendix A)). Tawny Frogmouths *Podargus strigoides* were observed on the south-western boundary, where the reserve, the walking track beside the apartments and the sports fields intersect. Eastern Ring-tailed Possum dreys were found in the denser, taller shrubs within the reserve, and also in similar locations and amongst the mistletoes growing in the trees above the walking track on the western side of the reserve.

Dense foliage and the variety of shrub species provide abundant nesting and foraging resources and protection from predation, especially suitable for smaller bush birds. The sandy soils and abundant leaf litter within the reserve provides habitat for reptiles and numerous invertebrate species, although no reptiles were recorded during fauna assessment and invertebrates were not surveyed. The results here are just a snapshot of the fauna observed during the site assessment. The list of fauna recorded from the reserve as outlined in Table 4 and Appendix A of this document as well as the list of birds recorded (71 species) from the reserve over a 40-year period by a local resident, and FBRHS member, Michael Norris (pers. comm), illustrates the diversity of bird life that make use of the various habitats within the heathland reserve.

3.2.2 Sandringham College sports fields

A total of 11 species of birds and six species of mammals were recorded from the college sports fields and adjacent trees during the two sites visits (Table 5).

The majority of the birds recorded from the sports fields or observed traversing the sports fields on the way to or from the reserve are considered generalist in terms of habitat requirements. There was one bird species, the Masked Lapwing *Vanellus miles novaehollandiae*, that was only recorded from the sports fields. Masked Lapwings are a bird of open spaces such as wetlands and grasslands, as provided by the maintained fields, rather than the denser remnant heathland within the reserve. These birds occur on many sporting fields across Melbourne and further afield and have been recorded breeding on such open grassy areas as that currently provided by the existing ovals.

Five out of the six mammal species, with the exception of the Eastern Ring-tailed Possum *Pseudocheirus peregrinus*, observed were only recorded from this part of the study area. Eastern Ring-tailed Possums and Common Brush-tailed Possum *Trichosurus vulpecula* were recorded from the trees along the southern, eastern and northern boundary of the sports fields. Grey-headed Flying Fox *Pteropus poliocephalus* and White-striped Freetail Bat *Austronomus australis* were observed flying over the sports fields during the spotlight survey, while *Domestic Cat and *Red Fox were also observed in areas close to the residences on the eastern side of the study area.

Apart from the habitat associated with the sports fields, the only other substantial habitat within the college grounds are the planted trees, both native and exotic, that occur along the study site boundary with Holloway Road, the residences to the east and the reserve to the north. A number of active Eastern Ring-tailed Possum dreys and recently used bird's nests were found within these trees during the diurnal and spotlight survey. Some of the larger trees may also provide nesting hollows or shelter for other fauna such as parrots and reptiles.

Table 5 Fauna recorded during site meeting in May 2021 and during fauna assessment Nov 2021, including origin, conservation status and location of siting

Scientific Name	Common Name	Origin	EPBC / FFG Status	Heathland Reserve	Secondary College
BIRDS					
Acanthiza pusilla	Brown Thornbill			X	
Acridotheres tristis	Common Myna	*		X	X
Anthochaera carunculata	Red Wattlebird			X	X
Anthochaera chrysoptera	Little Wattlebird			X	
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo			X	
Columba livia	Domestic Pigeon	*		X	X
Corvus mellori	Little Raven			X	X
Eolophus roseicapilla	Galah			X	X
Falco cenchroides	Nankeen Kestrel			X	
Glossopsitta concinna	Musk Lorikeet			X	
Grallina cyanoleuca	Magpie-lark			X	
Gymnorhina tibicen	Australian Magpie			X	X
Hirundo neoxena	Welcome Swallow			X	X
Manorina melanocephala	Noisy Miner			X	X
Platycercus eximius	Eastern Rosella			X	X
Podargus strigoides	Tawny Frogmouth			X	
Sericornis frontalis	White-browed Scrubwren			X	
Spilopelia chinensis	Spotted Dove	*		X	
Strepera graculina	Pied Currawong			X	
Trichoglossus molucannus	Rainbow Lorikeet			X	X
Turdus merula	Common Blackbird	*		X	
Vanellus miles	Masked Lapwing				X
Zosterops lateralis	Silvereye				X
MAMMALS					
Austronomus australis	White-striped Free-tailed Bat				X
Felis catus	Domestic Cat (feral)	*			X
Pseudocheirus peregrinus	Eastern Ring-tailed Possum			X	X
Pteropus poliocephalus[6]	Grey-headed Flying-fox		VU / vu		X
Trichosurus vulpecula	Common Brush-tailed Possum				X
Vulpes vulpes	Red Fox	*			X

[6] observed flying overhead

Figure 3 Sandringham Netball Centre, remnant patches (Habitat Zones 1 – 5), and planted and indigenous trees within the project area

3.3 Significant species and ecological communities

3.3.1 Threatened flora

Twenty-four threatened flora species have been previously recorded within five kilometres of the study area, this includes four species listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and an additional 20 listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) (Table 6). None of these species are considered likely to occur within the Sandringham College sportsground: three species are outside their known distribution (negligible likelihood of occurrence), habitat for six species is unlikely to have ever been suitable (negligible likelihood), and habitat for fifteen species is now considered too modified and degraded (low likelihood).

Table 6 Sandringham Netball Centre - threatened flora species previously recorded within 5 km of the study area

EPBC	FFG	Species	Common Name	Number of records	Date of last record	Likelihood of occurrence
	en	*Banksia saxicola*	Rock Banksia	3	1/01/1991	negligible
	en	*Billardiera scandens s.s.*	Velvet Apple-berry	3	14/08/2008	low
	cr	*Caladenia oenochila*	Wine-lipped Spider-orchid	1	01/09/1898	low
	en	*Caladenia reticulata s.s.*	Veined Spider-orchid	1	1/10/1924	negligible
EN	cr	*Caladenia robinsonii*	Frankston Spider-orchid	2	1/09/1929	low
	en	*Caladenia venusta*	Large White Spider-orchid	6	1/10/1919	low
	en	*Callitriche umbonata*	Winged Water-starwort	1	1/10/1908	negligible
	en	*Corybas fimbriatus*	Fringed Helmet-orchid	1	9/08/1900	low
	en	*Diuris behrii*	Golden Cowslips	1	01/10/1887	low
	en	*Diuris punctata* var. *punctata*	Purple Diuris	1	1/11/1910	negligible
	en	*Diuris X palachila*	Broad-lip Diuris	1	1/09/1920	low
	en	*Eucalyptus fulgens*	Green Scentbark	1	7/08/2008	negligible
EN	en	*Euphrasia collina* subsp. *muelleri*	Purple Eyebright	2	9/08/1900	low
	en	*Euphrasia scabra*	Rough Eyebright	1	01/01/1856	low
VU	vu	*Glycine latrobeana*	Clover Glycine	1	01/11/1852	low
	en	*Heterozostera nigricaulis*	Australian Grass-wrack	1	18/01/2007	negligible
	en	*Philydrum lanuginosum*	Woolly Waterlily	2	1/12/1907	negligible
	vu	*Prostanthera nivea* var. *nivea*	Snowy Mint-bush	6	13/03/2009	low
	en	*Pterostylis pedoglossa*	Prawn Greenhood	6	5/05/1934	low
	en	*Pterostylis* X *toveyana*	Mentone Greenhood	9	6/07/1919	low
	en	*Salsola tragus* subsp. *pontica*	Coast Saltwort	2	6/03/1963	negligible
EN	en	*Thelymitra epipactoides*	Metallic Sun-orchid	5	1/10/1933	low
	en	*Triglochin minutissima*	Tiny Arrowgrass	1	01/11/1852	negligible
	en	*Xanthosia tasmanica*	Southern Xanthosia	1	11/10/1942	low

Key:

EPBC Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: VU = Vulnerable, EN = Endangered, CR = Critically Endangered.
FFG Victorian *Flora and Fauna Guarantee Act 1988*: cr = critically endangered, en = endangered, v = vulnerable.

3.3.2 Threatened fauna

From the desktop assessment, a total of 60 threatened fauna species have been recorded from within the 5 km buffer of the study area (Table 7). They include: 48 bird species, eight mammal species, one reptile and one frog species, and two invertebrates species.

Of these 60 species, only five are considered to have any likelihood of occurrence in the study area: Grey-headed Flying Fox (moderate), White-throated Needletail *Hirundapus caudacutus* (low), Grey Goshawk (low) and Swift Parrot *Lathamus discolor* (low). The Grey-headed Flying-fox was observed flying over the secondary college oval after dark, during the spotlight survey, and would only utilise the site when there is prolific flowering of nectar-producing tree species, such as eucalypts and banksias. The Grey Goshawk and the Common Bent-wing Bat may occasionally forage for prey within and above the study area. Similarly, White-throated Needletails may glean aerially above the site but are unlikely to land within the site.

All other species in Table 7 below were considered to have a negligible likelihood of occurrence based on the following criteria:

- Date of latest record being >30 years for species not considered to be 'locally extinct'
- Lack of suitable habitat within the study area; 41 of the species listed below are either marine or wetland species.
- Some species are locally extinct such as Australian Bustard, Brolga, Hooded Robin, Grey-crowned Babbler and Plains Wanderer.

Table 7 Sandringham Netball Centre - threatened fauna species previously recorded within 5 km of the study area

EPBC	FFG	Species	Common Name	No. of records	Date of last record	Likelihood of occurrence
Birds						
	en	*Accipiter novaehollandiae*	Grey Goshawk	2	4/06/2017	Low
MIG	vu	*Actitis hypoleucos*	Common Sandpiper	1	1/10/1962	Negligible
	vu	*Anseranas semipalmata*	Magpie Goose	1	29/07/2018	Negligible
	en	*Antigone rubicunda*	Brolga	1	18/12/1818	Negligible
	vu	*Ardea alba modesta*	Eastern Great Egret	147	22/07/2019	Negligible
	cr	*Ardeotis australis*	Australian Bustard	1	01/01/1835	Negligible
MIG	en	*Arenaria interpres*	Ruddy Turnstone	4	11/10/2010	Negligible
	vu	*Aythya australis*	Hardhead	209	27/07/2019	Negligible
	vu	*Biziura lobata*	Musk Duck	7	19/09/2018	Negligible
EN	cr	*Botaurus poiciloptilus*	Australasian Bittern	3	20/10/1973	Negligible

EN	en	*Calidris canutus*	Red Knot	3	20/10/1973	Negligible
CR	cr	*Calidris ferruginea*	Curlew Sandpiper	6	20/10/1973	Negligible
CR	cr	*Calidris tenuirostris*	Great Knot	1	1/10/1962	Negligible
VU	vu	*Charadrius leschenaultii*	Greater Sand Plover	2	20/10/1973	Negligible
EN	en	*Charadrius mongolus*	Lesser Sand Plover	1	20/10/1973	Negligible
	en	*Egretta garzetta*	Little Egret	2	20/10/1973	Negligible
	cr	*Falco subniger*	Black Falcon	1	8/06/2019	Negligible
	en	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	3	6/02/2018	Negligible
	vu	*Hieraaetus morphnoides*	Little Eagle	1	1/01/1971	Negligible
VU	vu	*Hirundapus caudacutus*	White-throated Needletail	7	2/09/2018	Low
MIG	vu	*Hydroprogne caspia*	Caspian Tern	5	8/07/2019	Negligible
	en	*Ixobrychus dubius*	Australian Little Bittern	3	21/04/2014	Negligible
CR	cr	*Lathamus discolor*	Swift Parrot	5	1/11/2000	Low
	vu	*Lewinia pectoralis*	Lewin's Rail	1	4/02/1982	Negligible
MIG	vu	*Limosa lapponica*	Bar-tailed Godwit	1	20/10/1973	Negligible
MIG	cr	*Limosa limosa*	Black-tailed Godwit	1	1/01/1962	Negligible
	vu	*Lophoictinia isura*	Square-tailed Kite	2	13/02/2007	Negligible
EN	en	*Macronectes giganteus*	Southern Giant-Petrel	1	20/10/1973	Negligible
	vu	*Melanodryas cucullata*	Hooded Robin	1	1/01/1971	Negligible
	vu	*Ninox strenua*	Powerful Owl	1	1/08/1927	Negligible
CR	cr	*Numenius madagascariensis*	Eastern Curlew	5	10/03/2001	Negligible
MIG	en	*Numenius phaeopus*	Whimbrel	1	1/01/1962	Negligible
	vu	*Oxyura australis*	Blue-billed Duck	15	12/03/2018	Negligible
CR	cr	*Pedionomus torquatus*	Plains-wanderer	2	1/05/1956	Negligible
MIG	vu	*Pluvialis fulva*	Pacific Golden Plover	3	20/10/1973	Negligible
MIG	vu	*Pluvialis squatarola*	Grey Plover	4	20/10/1973	Negligible
VU	en	*Polytelis swainsonii*	Superb Parrot	1	1/01/1975	Negligible

	vu	*Pomatostomus temporalis*	Grey-crowned Babbler	1	22/09/1985	Negligible
	en	*Pyrrholaemus sagittatus*	Speckled Warbler	1	1/01/1971	Negligible
	vu	*Spatula rhynchotis*	Australasian Shoveler	7	9/05/2001	Negligible
	vu	*Stagonopleura guttata*	Diamond Firetail	1	1/01/1971	Negligible
MIG	cr	*Sternula albifrons*	Little Tern	1	20/10/1973	Negligible
VU	cr	*Sternula nereis*	Fairy Tern	2	30/10/2017	Negligible
	en	*Stictonetta naevosa*	Freckled Duck	17	19/09/2018	Negligible
VU		*Thalassarche melanophris*	Black-browed Albatross	1	20/10/1973	Negligible
VU	vu	*Thinornis cucullatus*	Hooded Plover	1	01/01/1873	Negligible
MIG	en	*Tringa glareola*	Wood Sandpiper	2	1/10/1962	Negligible
MIG	en	*Tringa nebularia*	Common Greenshank	5	20/10/1973	Negligible
MIG	en	*Tringa stagnatilis*	Marsh Sandpiper	2	1/10/1962	Negligible
Mammals						
	vu	*Arctophoca forsteri*	Long-nosed Fur Seal	2	19/04/2020	Negligible
VU		*Mirounga leonina*	Southern Elephant Seal	1	1/02/2006	Negligible
VU	cr	*Megaptera novaeangliae australis*	Southern Humpback Whale	3	7/06/2000	Negligible
	vu	*Ornithorhynchus anatinus*	Platypus	1	22/09/1953	Negligible
VU	vu	*Pteropus poliocephalus*	Grey-headed Flying-fox	2	23/11/1997	Moderate
	cr	*Tursiops australis*	Burrunan Dolphin	7	14/04/2014	Negligible
	cr	*Miniopterus schreibersii oceanensis*	Common Bentwing-bat	1	-[7]	Low
	vu	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail Bat	2	24/04/2002	Negligible
Reptiles						
	cr	*Emydura macquarii*	Murray River Turtle	1	11/01/2011	Negligible
Amphibians						

[7] recorded by Friends of Bay Road Heathland Sanctuary

VU	vu	*Litoria raniformis*	Growling Grass Frog	5	16/10/1893	Negligible
Invertebrates						
	en	*Hypochrysops ignitus ignitus*	Fiery Jewel Butterfly	16	10/11/1988	Negligible
	en	*Athanopsis australis*	Southern Hooded Shrimp	1	23/08/1971	Negligible

Key:

EPBC Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: VU = Vulnerable, EN = Endangered, CR = Critically Endangered, MIG = Migratory Species list

FFG Victorian *Flora and Fauna Guarantee Act 1988*: cr = critically endangered, en = endangered, v = vulnerable.

3.3.3 Ecological communities

No ecological communities listed under the EPBC and FFG Acts were recorded. The Damp Sands Herb-rich Woodland, Sand Heathland and Heathy Woodland remnants within the study area do not form part of any ecological community listed under the EPBC Act or FFG Act.

4 Measures to minimise impacts

The current development plan avoids the removal of indigenous vegetation, including impacts to Tree Protection Zones (TPZs) (Figure 3). The majority of the planted trees and their associated TPZs are also avoided, including the new carpark and associated entry and exit points. Some planted trees in the western portion of the site will require removal (Figure 3). Some recent ground disturbance has already occurred in this area.

Key issues for the project in relation to protecting biodiversity values include: noise pollution, artificial light pollution, weed invasion, construction works, landscaping and user-related impacts. Measures to reduce impacts to biodiversity for each of these issues are addressed below.

4.1 Light pollution

Darkness has conservation value to the wildlife that utilise natural and modified habitats, in the same way that clean water and air, and functional soil does. Artificial light at night is increasing at a rate of about 2% per year globally (CoA 2020). Animals perceive light differently from humans, which makes it difficult to quantify light impacts, but studies have shown that artificial light can cause behavioural and physiological changes. Examples include difficulties with navigation to the sea in turtles that hatch on artificially lit beaches and delays in reproduction of Tammar Wallabies when exposed to artificial light (CoA 2020).

However, wildlife recorded within the study area are commonly located across the greater Melbourne area and have presumably adapted to some extent to the artificial light generated by suburban areas, and any further light impacts must be assessed against existing artificial light levels.

They Bayside Council area is mapped as having a moderate to high level of light pollution as shown on the world light pollution map (www.lightpollutionmap.info). The level recorded within and surrounding the study area is 18.5 magnitude.arcsecond^2. When compared with other light environments it is classed as 7 on the Bortle scale, which shows light pollution on a 1-9 scale, where 1 is excellent (the sky is truly black, and there is a maximum number of astronomical entities visible), to 9 which categorises inner city skies, the sky is white and few stars are visible. The Bayside Council area is typical of the suburban/urban transition area for light pollution. As such, wildlife utilising the area would already be adapted to a relatively high level of light pollution, however pockets of darkness such as more vegetated areas that receive less light spill may be important for the persistence of wildlife in these areas, and as such, further light pollution, particularly around areas of remnant vegetation should be minimised. This diversity of lighting environments to attract species is supported by studies into microbat activity in urban environments such as that by Scanlon and Petit (2008) which showed that microbat activity was higher in dark parks compared with artificially lit parks within the urban environment. Species may avoid artificial light differentially (e.g Moretto and Francis 2017 and within the Bayside Council area, Ecology Australia 2018) and thus a diversity of light environments is required to maximise urban fauna diversity.

Six microbat species have been recorded within the study area (Appendix A), including the threatened Common Bent-wing Bat *Miniopterus schreibersii oceanensis* which is listed under FFG Act. This group of species, along with nocturnal birds such as the Tawny Frogmouth which has been recorded within the study area are most likely to be impacted by changes to artificial light. Diurnally active birds may also be impacted if suitable nesting sites occur in areas affected by light spill.

To minimise light impacts on fauna in the study area, it is recommended that measures within Appendix A Best Practice Lighting Design *in National Light Pollution Guidelines for Wildlife: including marine turtles, seabirds and migratory shorebirds* (CoA 2020) are adhered to. Specifically, the following are priorities for this project:

- Start with natural darkness wherever possible and only add light for specific purposes (e.g safety, nocturnal sporting activities)

- Utilise lighting and covers that reduce light spill into surrounding areas, especially in areas adjacent to native vegetation
- Where light is required, minimise the hours that it is used, with automatic timers to switch lights off as soon as they are no longer required. Many microbat species are not active until later in the evening, so keeping artificial lighting to the minimum time possible will reduce impacts to those species
- Consider Australian Standard AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting when carrying out lighting design.
- Utilise light sources that do not emit in the lower part of the light spectrum, including ultraviolet light. Many species of fauna utilise this range, which is not used by humans (CoA 2020).
- If possible, provide screening in the form of dense vegetation between areas that will be artificially lit, and native vegetation. However, if this will impact on other important ecological values, then consideration of risk versus benefit is recommended

4.2 Noise pollution

Impacts of noise pollution on biodiversity have attracted increasing attention with global increases in environmental noise levels, from human population expansion, increased transport networks and more intense resource extraction. A recent synthesis of two decades of research documenting the effects of noise on wildlife (Shannon et. al., 2015) shows that there has been a rapid increase in the volume of published, peer-reviewed articles since 2010, but still the majority of studies (over 81%) have been conducted in North America or Europe, and most terrestrial studies have concentrated on impacts to vocal communication, particularly in birds and mammals (reviewed *in* Shannon et. al., 2015). Ecological impacts of noise pollution include avoidance of “noisy” areas by some species, changes to nesting behaviour and even increased population size in species that can tolerate greater noise levels, due to reduction in predators and competitors in such environments (Shannon et. al. 2015). Despite this increase in research, few projects consider or propose mitigation for noise levels. When proposed, mitigation measures include: noise barriers, changes to human use schedules, to reduce noise at critical times for fauna (e.g reduced noise around dawn and dusk or during summer when migratory shorebirds are present. “Quiet” technology is also contributing to reductions in environmental noise in new projects.

The project will increase environmental noise in the immediate vicinity, with increased traffic noise and recreational noise (movement and noise from crowds of people, whistle blowing during netball games, mainly in the outdoor courts). Measures that will reduce noise impacts to nearby human populations are also likely to benefit the local fauna community. These include:

- Reducing or eliminating early morning and late afternoon/evening noise through reduced play schedules (use of more courts for shorter periods)
- Utilise quiet technology where appropriate, including noise reduction batts installed into new indoor court buildings
- Investigate the potential effectiveness of one or more noise walls around outdoor courts, especially on the side closest to sensitive receptors,
- Use of the most noise absorbing court floor materials (for outside and inside courts) to be considered during design
- Landscaping to consider noise screening using dense vegetation in appropriate areas, as per measures used for transport upgrades, even if these areas cannot be high, some screening will benefit fossorial species such as reptiles and amphibians.

4.3 Weed management

Many high threat weed species require management before construction and landscaping commences (Table 8). These weed species will also need to be managed in the longer term. The level of weed management will affect the success of the indigenous landscape plantings and is also required to reduce weed propagules dispersing into the Sanctuary. Care must be taken to ensure indigenous plants are not impacted by the weed management works.

Monitoring of weed species and the efficacy of weed management works should be undertaken monthly during construction. Once construction has been completed monitoring should continue monthly for six months post-construction, and then twice a year on an ongoing basis.

Table 8 Sandringham Netball Centre – high threat weed species requiring management

Species	Common Name	Treatment options
Asparagus asparagoides	Bridal Creeper	• areas with little to no indigenous groundcover can be dug out, removing tuber and rhizomes • sprayed with herbicide during flowering period (winter – spring)
Cirsium vulgare	Spear Thistle	• hand remove • spray with herbicide late winter - spring
Coprosma repens	Mirror Bush	• hand remove seedlings and small plants • larger plants controlled using cut and paint or drill and fill methods
Cotoneaster glaucophyllus	Large-leaf Cotoneaster	• hand remove seedlings and small plants • larger plants controlled using cut and paint or drill and fill methods. Best undertaken spring – early summer before fruit develops.
Fraxinus angustifolia	Desert Ash	• dig out seedlings and small plants • larger plants controlled using cut and paint or drill and fill methods. Treatment should not be undertaken during winter when plants are dormant
Genista monspessulana	Montpellier Broom	• dig out seedlings and small plants • larger plants controlled using cut and paint or drill and fill methods.
Lycium ferocissimum	African Boxthorn	• dig out seedlings and small plants • larger plants controlled using cut and paint or drill and fill methods.
Salpichroa origanifolia	Pampas Lily-of-the-Valley	• areas with little to no indigenous groundcover can be dug out, removing sucking roots • sprayed with herbicide
Tradescantia fluminensis	Wandering Tradescantia	• areas with little to no indigenous groundcover can be dug out • sprayed with herbicide (spring – autumn, avoid hot weather)

4.4 Construction works

The perimeter of the works area needs to be fenced during construction to ensure no impacts occur to the remnant vegetation and established planted trees. These fences should be signed as no-go-zones, and no equipment or spoil are to be stored in these areas. The fences will need to remain in place for the duration of the works.

If trees are to be removed as part of the project, then there must be the requirement for a zoologist to undertake a pre-clearance fauna habitat check of all vegetation planned for removal. If fauna habitat is found, then a plan is to be developed to allow for the relocation of native fauna from the vegetation either prior to or during the vegetation removal. The relocation must be undertaken by an experienced zoologist / wildlife handler who has a Wildlife Management Authorisation permit from DELWP.

Weed management, fencing and fauna salvage will need to be addressed within the Construction Environmental Management Plan for the project (refer Section 5).

4.5 Landscaping

Landscaping for the project will use indigenous vegetation. It is recommended that a site assessment of the areas to be landscaped is undertaken by the contracted landscape architect prior to the plans being developed so that the native vegetation can be accurately mapped, and to ensure plantings work with the existing vegetation. Similarly, prior to landscaping works commencing, native vegetation to be retained needs to be clearly marked so that it is not impacted by the works. Plant stock should be obtained from the Bayside Nursery.

4.6 User-related issues

The sportsgrounds are currently used by the school and the public for outdoor recreation and dog walking. The new sports facilities may bring more people through the reserve, as well as their dogs. The public will use the walkway through the Bay Road Heathland Sanctuary to gain access sportsgrounds. Dogs off lead are at greater risk of directly impacting the biodiversity values within the sanctuary through disturbing the vegetation (digging and trampling) and chasing and predating wildlife, and indirectly via nutrient enrichment (from faeces). It is recommended that the limited opening times to the fenced portions of the Sanctuary be maintained and that signs are installed to indicate that the sanctuary walkway is a dog on lead area, and no dogs are permitted within the fenced area.

5 Legislative implications

5.1 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legislative framework to protect Matters of National Environmental Significance (MNES), which include world heritage properties, national heritage properties, wetlands of international importance (i.e. Ramsar wetlands), Commonwealth marine areas, the Great Barrier Reef Marine Park, listed threatened flora and fauna species and ecological communities, and listed migratory fauna species. The EPBC Act applies to public and private land.

If a project is likely to have a significant impact on one of the nine MNES listed under the EPBC Act, the action or proposal must be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE; formerly Department of the Environment and Energy, DoEE). This 'referral' is then released to the public for comment. A 'significant' impact is defined under the EPBC Act as an impact that is important, notable, or of consequence, having regard to its context or intensity (DoE 2013).

Under the EPBC Act, actions proposed that have a significant impact upon MNES require approval from the Environment Minister and are described as 'controlled actions'. An action includes any project, development, undertaking, activity or series of activities.

No ecological communities listed under the EPBC Act occur within the project area. The project area is also not considered likely to support important habitat for listed marine or migratory species and does not include or adjoin any Ramsar Wetlands.

No flora species listed under the EPBC Act has a moderate or higher likelihood of occurrence within the project area.

The Grey-headed Flying Fox is expected to forage, at least irregularly, in the trees within and adjoining the study area, and the Swift Parrot may also occasionally forage in the area. The Swift Parrot is a migratory species from Tasmania that would only use these trees enroute to other feeding grounds during their autumn-winter migration to the mainland. White-throated Needletails are also a migratory bird species that may be observed within the study area, given stormy or frontal weather conditions, however these birds are almost entirely aerial while in Australia. Any removal of vegetation from the sportsgrounds, including trees, is not considered likely to have a significant impact on the Grey-headed Flying-fox, Swift Parrot or White-throated Needletail.

5.2 Victorian *Flora and Fauna Guarantee Act 1988*

The *Flora and Fauna Guarantee* (FFG) *Act 1988* applies to public land in Victoria and lists flora and fauna species and ecological communities that are recognised as threatened in the State, as well as threatening process to Victorian ecological values. The Act includes private land where critical habitat has been identified. Critical habitat includes areas which make a significant contribution to the conservation of listed threatened species or communities. It may also include areas that support ecological processes or ecological integrity that significantly contribute to the conservation of listed species or communities. No critical habitat has yet been identified under the Act but is likely to be listed in the near future. Any works in an area where a Critical Habitat Determination has been made requires a permit from the Minister for Environment.

The FFG Act also recognises protected flora. This includes flora listed as threatened under the FFG Act, plant taxa that belong to ecological communities listed under the Act, and non-threatened plant taxa that require protection for other reasons (e.g. over-collection). A protected flora permit from Department of Environment, Land, Water and Planning (DELWP) is required where proposed works will impact on protected flora on public land.

Flora and Fauna Guarantee (Amendment) Act 2019

Amendments to the FFG Act were recently passed by the Victorian Parliament in the *Flora and Fauna Guarantee Amendment Act 2019* (the Amendment Act) to provide for a modern and strengthened framework for the protection of Victoria's biodiversity. It includes re-classification of listed species statuses to improve consistency and reduce duplication, clarification of existing powers to determine critical habitat, and provision of stronger enforcement powers, among other amendments.

The amendments came into effect on 1 June 2020. DELWP is in the process of developing a range of instruments to support the implementation of the reforms, including the preparation of new regulations, ministerial guidelines, templates and procedures. Rare and threatened species on Victoria's advisory list have been considered for listing as threatened under the FFG Act in accordance with the intergovernmental Common Assessment Method (CAM). The CAM adopts the categories and criteria of the International Union for the Conservation of Nature (IUCN) Red List of threatened species. The revised FFG threatened was gazetted on 1 July 2021.

The *Flora and Fauna Guarantee Amendment Act 2019* also contains an obligation or duty on public authorities and ministers to consider potential biodiversity impacts when exercising their functions (set out in new section 4B of the Act). Public authorities must give proper consideration to the Act's objectives, so far as is consistent with the proper exercising of their functions. Ministerial guidelines are currently being developed to provide practical steps to support public authorities and ensure biodiversity is given proper consideration.

Potential impacts on biodiversity that should be considered include: long and short term impacts; detrimental and beneficial impacts; direct and indirect impacts; cumulative impacts; and potentially threatening processes. Direct impacts to FFG Act listed species or communities, such as clearing habitat, require approval under the Act.

No flora species classified as threatened under the FFG Act was recorded or has a moderate or higher likelihood of occurrence within the project area. The Grey-headed Flying Fox, Swift Parrot, Grey Goshwak, Common Bentwing Bat and White-throated Needletail may occasionally utilise the project area while foraging, however the proposed works are not expected to significantly impact these species.

Based on the current development plans a protected flora permit is unlikely to be required. If the plans change and protected native flora is proposed for removal (e.g. wattles) then a permit will need to be sought from DELWP before works commence.

5.3 Victorian *Wildlife Act 1975*

The *Wildlife Act 1975* provides for the protection and conservation of native wildlife (fauna) within Victoria. Under the Act a person must not hunt, take or destroy endangered, notable or protected wildlife; this includes all native vertebrate animals, all kinds of deer, non-indigenous quail, pheasants, and partridges, and all terrestrial invertebrate animals listed under the FFG Act 1988.

Some fauna may require relocating from trees and vegetation located within the works area (i.e. western boundary of the project area). Once works are planned to begin, an experienced zoologist(s) with appropriate DELWP wildlife management authorisations should conduct pre-clearance assessments of all trees and

vegetation to be removed, and be on-site during the removal, to salvage and relocate any native fauna as per their permit conditions. This requirement should be addressed in the Construction Environmental Management Plan.

5.4 Victorian *Planning and Environment Act 1987*

The *Planning and Environment Act 1987* establishes a framework for planning the use, development and protection of land in Victoria. This includes native vegetation retention controls and planning permit triggers in Clauses 52.16 (Native Vegetation Precinct Plan) and 52.17 (Native Vegetation) of all Victorian planning schemes, as well as additional controls in the form of overlays. No biodiversity related overlays affect the project area.

Clause 52.17 outlines the requirement for a permit to remove, destroy or lop native vegetation, including dead vegetation. When 52.17 applies, the application of the three-step approach of avoid, minimise and offset must be addressed as outlined in Victoria's native vegetation policy the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines; DELWP 2017).

Within the Guidelines native vegetation is identified as a patch or scattered tree[8]. Five patches and one large scattered tree were recorded within the project area (Figure 3). None of this vegetation is proposed to be impacted by the works, and therefore no native vegetation offsets will be required.

5.5 *Victorian Catchment and Land Protection Act 1994*

Under Section 20 of the *Catchment and Land Protection Act 1994* (CaLP Act), all landowners, including the Crown, public authorities and licensees of Crown lands, must take all reasonable steps to:

- Avoid causing or contributing to land degradation which causes or may cause damage to land of another landowner
- Eradicate regionally prohibited weeds
- Prevent the growth and spread of regionally controlled weeds on their land
- Prevent the spread of, and as far as possible, eradicate established pest animals.

These are also provisions within the Act to prevent the spread of declared noxious weeds, through regulating the purchase, sale, possession for the purposes of sale, display, propagation or transport of these species into or within Victoria. This includes if noxious weeds or material containing noxious weeds or weed seed is transported from the construction area.

There are four categories of noxious weeds:

- State prohibited - are weed species that either do not occur in Victoria but pose a significant threat if they invade, or are present, pose a serious threat and can reasonably be expected to be eradicated. These weed species are to be eradicated from the state.
- Regionally prohibited weeds - are weeds that are not widely distributed in a region but are capable of spreading further. It is reasonable to expect that these species can be eradicated from a region and are to be managed with that goal. Landowners and managers have the responsibility to take all reasonable steps to prevent the growth and spread of regionally controlled weeds on their land.

[8] refer to the Methods for definitions of patch and scattered trees.

- Regionally controlled weeds – are weed species that are usually widespread in a region. To prevent their spread, ongoing control measures are required. Landowners and managers need to prevent the growth and spread of regionally controlled weeds on their land.
- Restricted weeds - plants that pose an unacceptable risk of spreading in Victoria and are a serious threat to another state or territory. Trade in these weeds and their propagules (either as plants, seeds or contaminants in other materials) is prohibited.

Five noxious weed species were recorded in the project area, they include:

1. Bridal Creeper *Asparagus asparagoides* - restricted

2. Spear Thistle *Cirsium vulgare* - regionally controlled

3. Montpellier Broom *Genista monspessulana* - regionally controlled

4. Sour Sob *Oxalis pes-caprae* - restricted

5. Pampas Lily-of-the-Valley *Salpichroa origanifolia* - regionally controlled

Control of these noxious weed species will be required for the project and would ideally commence prior to works starting. The management of these weeds and other high threat weed species should be addressed in a Construction Environmental Management Plan (refer below).

6 Summary

Sandringham College sports fields where the proposed netball centre will be located is dominated by exotic grasses and dicot herbs. Small patches of remnant vegetation, as well as established planted exotic and native trees occur around the boundary of the sports fields. This vegetation supports habitat for possums and locally abundant native bird species. The sports fields more broadly maybe utilised by microbats and raptors while foraging for prey. The remnant patches support a relatively low diversity of indigenous flora and the ground layer is predominately dominated by exotic vegetation. The highest quality patch was located on the northern boundary of the sportsgrounds.

Impacts to the remnant vegetation (remnant patches and scattered trees) and the majority of the planted vegetation will be avoided. Some planted trees will need to be removed on the western boundary between the sports fields and the school buildings. A Construction Environmental Management Plan (CEMP) for the project is recommended. The CEMP should include the following:

- Fauna management – a pre-clearance check by a qualified zoologist of any vegetation to be removed to determine if fauna are living within the vegetation (e.g possum dreys or birds nests). If fauna are detected then a plan would need to be developed to allow for the relocation of native fauna from the vegetation. The relocation must be undertaken by an experienced zoologist / wildlife handler who has a Wildlife Management Authorisation permit from DELWP.
- Weed management – a Weed Management Plan that addresses the species to be managed; the techniques/treatments used to control the weeds species; timing of the works, including follow-up treatment; and monitoring of weed species and associated management. Weed management would need to commence before construction begins and need to be ongoing during construction to ensure weeds are successfully controlled or eliminated.
- Fencing – temporary fencing around the perimeter of the works area, which should be at least 1.2 m high. This is to ensure no works or equipment/spoil is placed within areas supporting planted or remnant vegetation. Signage should be placed on the fencing to indicate the area inside the fence is a no-go zone.

No direct impacts to the Bay Road Heathland Sanctuary are expected. Potential indirect impacts most relevant to the proposal include light pollution, noise pollution, weed invasion, and user-related uses. Mitigation measures to reduce these impacts include:

- weeds – management of high threat weed species within the vegetation adjoining the sportsground to reduce the weed propagules entering the reserve.
- user-relate issues – signage at both entry points to the walkway through the reserve stating that the walkway is a dog on-lead area and no dogs within the fenced areas.
- lighting – lighting of the sportsground to be inline with the federal guidelines *Best Practice Lighting Design in National Light Pollution Guidelines for Wildlife: including marine turtles, seabirds and migratory shorebirds* (CoA 2020). This would include consideration of the type of lights use (including light wavelength), timing and duration of lighting, location of lighting and measures to reduce light spill, and additional plantings to improve screening between lit areas and remnant vegetation (refer Section 4.2).
- noise – to include measures to reduce the duration and intensity of noise including consideration of building materials (surfaces and walls), operating times, and use of dense plantings (refer Section 4.3).

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Appendix A

Fauna species previously recorded within Bay Road Heathland Sanctuary

Key:
FoBRHS – Friends of the Bay Road Heathland Sanctuary
VBA – Victorian Biodiversity Atlas
* – introduced
CR – Critically Endangered under the EPBC Act
MIG – listed as Migratory species under the EPBC Act
cr – critically endangered under the FFG Act
en – endangered under the FFG Act

		Species Name	Common Name	Source		
				iNaturalist	VBA	FBRHS
		Invertebrates				
Insects		*Calolampra sp.*		x		
		Laxta granicollis	Bark cockroach	x		
		Celatoblatta sp.		x		
		Drymaplaneta semivitta	Gisborne Cockroach	x		
		Platyzosteria melanaria		x		
		Balta sp.		x		
		Ellipsidion australe	Austral Ellipsidion	x		
		Metopum sp.		x		
		Castiarina flavopicta		x		
		Diphucrania acuducta		x		
		Melobasis purpurascens		x		
		Chauliognathus tricolor	Tricolor Soldier Beetle	x		
		Notonomus sp.		x		
		Philophlaeus sp.		x		
		Sarticus sp.		x		
		Scaraphites rotundipennis		x		
		Trigonothops		x		
		Trigonothops sp.		x		
		Ancita marginicollis		x		
		Coptocercus aberrans		x		
		Obrida fascialis		x		
		Phacodes obscurus		x		
		Phoracantha punctata		x		
		Rhytiphora decipiens		x		
		Aporocera consors		x		
		Cadmus calomeloides		x		
		Monolepta subsuturalis		x		
		Peltoschema delicatulum		x		
		Peltoschema hamadryas		x		
		Psylliodes sp.	Flea Beetle	x		
	*	*Xanthogaleruca luteola*	Elm Leaf Beetle	x		
		Eleale aspera		x		
		Lemidia accincta		x		
		Bucolus sp.		x		
		Coccinella transversalis	Transverse Ladybird Beetle	x		
		Harmonia conformis	Large Spotted Ladybird	x		
		Illeis galbula	Fungus-eating ladybird	x		
		Novius cardinalis	Vedalia Beetle	x		
		Platisus angusticollis		x		
		Leptopius duponti	Broad-back weevil	x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Neolaemosaccus sp.		x		
	Ochrophoebe uniformis		x		
	Orthorhinus klugii	Vine Weevil	x		
	Perperus sp.		x		
	Conoderus basalis		x		
	Thallis sp.		x		
	Saprinus sp.		x		
	Corticariinae sp.		x		
	Lamprima aurata	Golden Stag Beetle	x		
	Porrostoma rhipidium	Long-nosed Lycid Beetle	x		
	Mordellidae sp.	Pintail Beetles	x		
	Anoplognathus sp.	Christmas Beetles	x		
	Eupoecila australasiae	Fiddler Beetle	x		
*	*Heteronychus arator*	African Black Beetle	x		
	Heteronyx sp.		x		
	Liparetrus discipennis		x		
	Phyllotocus sp.		x		
	Adelium pustulosum		x		
	Amarygmus sp.		x		
	Celibe sp.		x		
	Gonocephalum sp.	Dusty Surface Beetles	x		
	Meneristes sp.		x		
	Nocar sp.		x		
	Pterohelaeus sp.	Blue Pie-dish Beetles	x		
	Saragus costatus		x		
	Uloma sanguinipes		x		
	Cerdistus rusticanoides		x		
	Neoaratus hercules		x		
	Neoscleropogon sp.		x		
	Bibio imitator		x		
	Aleucosia sp.		x		
	Docidomyia sp.		x		
	Geron sp.		x		
	Villa sp.		x		
	Calliphora dubia		x		
	Calliphora vicina	Blue Blowfly	x		
*	*Lucilia sericata*	Common European Greenbottle Fly	x		
	Dasineura tomentosa		x		
	Aedes alboannulatus		x		
	Aedes notoscriptus	Striped Mosquito	x		
	Sciapus sp.		x		
	Hydrellia sp.		x		
	Rhinotorini sp.		x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Homoneura sp.		x		
	Poecilohetaerus aquilus		x		
	Sapromyza sp.		x		
	Trigonometopsis binotata		x		
	Discobola australis		x		
	Symplecta pilipes		x		
	Metopochetus bivittatus		x		
	Coenosia sp.	Tiger Flies	x		
	Helina sp.		x		
	Trichophthalma sp.		x		
	Lindneromyia sp.		x		
	Rivellia sp.		x		
	Stomorhina discolor		x		
	Sarcophaga sp.	Common Flesh Flies	x		
	Sciaridae sp.	Dark-winged Fungus Gnats	x		
	Dichetophora biroi		x		
	Pherbellia javana		x		
	Australoactina sp.		x		
	Boreoides subulatus	Australian Wingless Soldier Fly	x		
	Exaireta spinigera	Garden soldier fly	x		
	Odontomyia sp.		x		
	Austalis pulchella	Beautiful Hover Fly	x		
	Eristalinus punctulatus	Native Drone Fly	x		
	Eristalis tenax	Common Drone Fly	x		
	Eumerus obliquus		x		
	Melangyna viridiceps	Common Halfband	x		
	Psilota rubra		x		
	Simosyrphus grandicornis	Yellow-shouldered Stout Hover Fly	x		
	Cylindromyia nigricosta		x		
	Prosena sp.		x		
	Senostoma sp.		x		
	Acanthonevroides basalis		x		
	Sphenella ruficeps		x		
	Anabarhynchus sp.		x		
	Ectinorhynchus sp.		x		
	Neodialineura polygramma		x		
	Taenogerella elizabethae		x		
	Leptotarsus humilis		x		
	Amphaces sp.		x		
	Stauralia compuncta		x		
	Achilini sp.		x		
	Melanacanthus scutellaris		x		
	Mutusca brevicornis	Long Broad-headed Bug	x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Creiis liturata		x		
	Glycaspis brimblecombei	Red Gum Lerp Psyllid	x		
	Callipappus sp.		x		
	Eurymeloides punctata	Mottled-head Gumtree Hopper	x		
	Ledromorpha planirostris		x		
	Neotartessus flavipes		x		
	Orosius orientalis		x		
	Rosopaella sp.		x		
	Stenocotis depressa		x		
	Amorbus obscuricornis	Eucalyptus Tip-wilter Bug	x		
	Adrisa sp.		x		
	Cylindrococcus spiniferus	Casuarina Gall	x		
	Anzora unicolor	Grey Planthopper	x		
	Siphanta acuta	Torpedo Bug	x		
	Eurinopsyche sp.		x		
	Chaetophyes sp.		x		
	Acanthuchus trispinifer	Tri-horned treehopper	x		
	Lincolnia lucernina		x		
	Pseudopantilius australis		x		
	Icerya purchasi	Cottony cushion scale	x		
	Monophlebulus sp.		x		
	Nabis kinbergii	Pacific Damsel Bug	x		
	Cuspicona simplex	Green Potato Bug	x		
	Cuspicona thoracica		x		
	Dictyotus conspicuus		x		
	Diemenia rubromarginata		x		
	Notius depressus		x		
	Ocirrhoe unimaculata		x		
	Ocirrhoe wilsoni		x		
	Oechalia schellenbergii	Schellenberg's Soldier Bug	x		
	Poecilometis strigatus		x		
	Protestrica stali		x		
	Eucalyptococcus sp.		x		
	Maconellicoccus australiensis		x		
	Melanococcus sp.		x		
	Gminatus australis	Orange Assassin Bug	x		
	Scolypopa australis	Passionvine Hopper	x		
	Physatocheila uniseriata		x		
	Microvelia sp.		x		
	Thyreus caeruleopunctatus	Blue-spotted Cloak-and-dagger Bee	x		
	Bethylidae sp.	Flat wasps	x		
	Braconidae sp.	Braconid Wasps	x		
	Chrysidini sp.		x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Hylaeus euxanthus	Yellow-collared Masked Bee	x		
	Hylaeus littleri	Littler's Masked Bee	x		
	Hylaeus perhumilis	Tiny Masked Bee	x		
	Hylaeus philoleucus	White-marked Masked Bee	x		
	Hyleoides concinna	Common Wasp-mimic Bee	x		
	Leioproctus sp.		x		
	Bembix sp.		x		
	Clitemnestra sp.		x		
	Tachysphex sp.		x		
	Evaniidae sp.	Hatchet Wasps	x		
	Anonychomyrma biconvexa		x		
	Camponotus sp.	Carpenter and Sugar Ants	x		
	Chelaner kiliani	Mono Ant	x		
	Crematogaster sp.	Cocktail Ants	x		
	Myrmecia pilosula	Black Jumper Ant	x		
	Myrmecia pyriformis		x		
	Ochetellus sp.		x		
	Pheidole sp.	Big-headed Ants	x		
	Rhytidoponera tasmaniensis		x		
	Gasteruption sp.		x		
	Austronomia sp.		x		
	Chilalictus sp.		x		
	Lasioglossum bicingulatum		x		
	Lasioglossum calophyllae		x		
	Lasioglossum hiltacus		x		
	Lipotriches submoerens	Red-legged Austral-Nomia	x		
	Echthromorpha intricatoria	White-spotted Ichneumonid Wasp	x		
	Enicospilus sp.		x		
	Labium sp.	Bee Parasitizing Wasps	x		
	Lissopimpla excelsa	Dusky-winged Ichneumonid Wasp	x		
	Netelia producta	Orange Caterpillar Parasitoid Wasp	x		
	Monomachus sp.		x		
	Odontomyrme sp.		x		
	Lophyrotoma interrupta		x		
	Turneromyia sp.		x		
	Trichilogaster acaciaelongifoliae	Longleaf Wattle Gall Wasp	x		
	Isodontia sp.	Grass-carrying Wasps	x		
	Podalonia tydei	Tyde's Sand Wasp	x		
	Thynnidae sp.	Thynnid Flower Wasps	x		
	Delta bicinctum	Orange Potter Wasp	x		
*	*Vespula germanica*	European Wasp	x		
	Nemophora sparsella		x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Macrobathra alternatella		x		
	Macrobathra desmotoma		x		
	Achyra affinitalis	Cotton Web Spinner	x		
	Culladia cuneiferellus		x		
	Hednota grammellus		x		
	Hellula hydralis	Cabbage Centre Grub	x		
	Eupselia melanostrepta		x		
	Anestia ombrophanes	Clouded Footman	x		
	Nyctemera amicus	Australian Magpie Moth	x		
	Utetheisa pulchelloides	Heliotrope Moth	x		
	Ardozyga amblopis		x		
	Anachloris subochraria	Golden Grass Carpet	x		
	Azelina biplaga		x		
	Boarmia sp.		x		
	Capusa cuculloides		x		
	Chlenias banksiaria		x		
	Chloroclystis approximata	Cherry Looper	x		
	Chloroclystis filata	Australian Pug Moth	x		
	Chlorocoma dichloraria	Guenee's Emerald	x		
	Chlorocoma melocrossa	Cream-fringed Emerald	x		
	Dichromodes mesogonia		x		
	Didymoctenia exsuperata		x		
	Dissomorphia australiaria	Dashed Geometrid	x		
	Ectropis bispinaria		x		
	Ectropis excursaria	Twig Looper	x		
	Ectropis fractaria	Ringed Bark Moth	x		
	Epidesmia tryxaria	Neat Epidesmia	x		
	Idiodes apicata	Bracken Moth	x		
	Microdes villosata		x		
	Mnesampela privata	Autumn Gum Moth	x		
	Paralaea beggaria		x		
	Phrissogonus laticostata	Apple Looper	x		
	Poecilasthena pulchraria	Native Cranberry Moth	x		
	Scioglyptis lyciaria		x		
	Scopula perlata	Australian Cream Wave	x		
	Scopula rubraria	Plantain Moth	x		
	Taxeotis stereospila		x		
	Thalaina clara	Clara's Satin Moth	x		
	Glyphipterix gemmipunctella		x		
	Elhamma australasiae		x		
	Ocybadistes walkeri	Yellow-banded Dart	x		
	Taractrocera papyria papyria		x		
	Entometa fervens	Gum Snout Moth	x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Pararguda nasuta	Wattle Snout Moth	x		
	Porela delineata		x		
	Nacaduba biocellata	Double-spotted Line Blue	x		
	Zizina labradus	Common Grass Blue	x		
	Ectopatria sp.		x		
	Helicoverpa punctigera	Australian Fruitworm	x		
	Mythimna convecta	Australian Armyworm	x		
	Neumichtis saliaris		x		
	Proteuxoa capularis		x		
	Proteuxoa hypochalchis	Black-bar Noctuid	x		
	Epicoma melanospila	Black Spot Moth	x		
	Heteronympha merope	Common Brown	x		
	Vanessa itea	Yellow Admiral	x		
	Vanessa kershawi	Australian Painted Lady	x		
	Aeolothapsa malacella		x		
	Atheropla decaspila		x		
	Delexocha ochrocausta		x		
	Endeolena xanthiella		x		
	Ericrypsina sp.		x		
	Heteroteucha translatella		x		
	Olbonoma triptycha		x		
	Philobota chrysopotama		x		
	Philobota latifissella		x		
	Tachystola thiasotis		x		
	Thema brevivitella		x		
	Tortricopsis uncinella		x		
	Zacorus carus		x		
	Papilio anactus	Small Dingy Swallowtail	x		
	Eurema smilax	Small Grass-yellow	x		
*	*Pieris rapae*	Cabbage White	x		
	Cebysa leucotelus	Australian bag moth	x		
	Metura elongatus	Saunders' Case Moth	x		
	Stangeia xerodes		x		
	Etiella behrii	Small Tabby	x		
	Opodiphthera eucalypti	Emperor Gum Moth	x		
	Monopis icterogastra	Wool Moth	x		
	Cryptoptila immersana		x		
	Epiphyas sp.		x		
	Epiphyas postvittana	Light Brown Apple Moth	x		
	Scieropepla polyxesta		x		
	Archimantis sobrina	Mallee Grass Mantis	x		
	Pseudomantis albofimbriata	False Garden Mantis	x		
	Apertochrysa edwardsi		x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Coniopteryx maculithorax		x		
	Carobius pulchellus		x		
	Myrmeleon acer	Common Brown Antlion	x		
	Stenosmylus tenuis		x		
	Adversaeschna brevistyla	Blue-spotted Hawker	x		
	Ischnura aurora	Aurora Bluetail	x		
	Xanthagrion erythroneurum	Red and Blue Damsel	x		
	Hemicordulia tau	Tau Emerald	x		
	Austrolestes analis	Slender Ringtail	x		
	Austrolestes annulosus	Blue Ringtail	x		
	Austrolestes leda	Wandering Ringtail	x		
	Diplacodes bipunctata	Wandering Percher	x		
	Orthetrum caledonicum	Blue Skimmer	x		
	Chortoicetes terminifera	Australian Plague Locust	x		
	Macrotona australis	Common Macrotona	x		
	Macrotona securiformis	Inland Macrotona	x		
	Phaulacridium vittatum	Wingless Grasshopper	x		
	Gryllotalpa australis	Southern Mole Cricket	x		
	Vandiemenella viatica		x		
	Conocephalus sp.	Lesser Meadow Katydids	x		
	Torbia viridissima	Gum-leaf Katydid	x		
	Trigonidium australiana		x		
	Nimbopsocus australis		x		
	Idolothrips spectrum	Giant Thrips	x		
Arachnids	*Arachnura higginsi*	Scorpion-tailed Spider	x		
	Araneus acuminatus	Pointy Orbweaver	x		
	Araneus albotriangulus	White-winged Orbweaver	x		
	Araneus circulissparsus	Speckled Orbweaver	x		
	Araneus psittacinus	Parrot-coloured Orbweaver	x		
	Araneus talipedatus	Slender Green Orbweaver	x		
	Argiope keyserlingi	Saint Andrew's Cross Spider	x		
	Argiope protensa	Tailed Forest Spider	x		
	Argiope trifasciata	Banded Garden Spider	x		
	Austracantha minax	Christmas Jewel Spider	x		
	Backobourkia	Outback Orb-weavers	x		
	Celaenia excavata	Common Bird-dropping Spider	x		
	Cyclosa fuliginata	Sooty Orbweaver	x		
	Dolophones	Wrap-around Spiders	x		
	Eriophora pustulosa	Knobbled Orbweaver	x		
	Gea theridioides	Common Gea	x		
	Hortophora biapicata		x		
	Hortophora transmarina		x		

	Species Name	Common Name	Source		
			iNaturalist	VBA	FBRHS
	Larinia sp.	Grass Orb-web Spiders	x		
	Phonognatha graeffei	Leaf-curling Spider	x		
	Plebs eburnus	Eastern Bush Orbweaver	x		
	Trichonephila edulis	Australian Golden Orbweaver	x		
	Cheiracanthium sp.	Longlegged Sac Spiders	x		
	Cheiracanthium gracile	Slender Sac Spider	x		
	Clubiona	Leafcurling Sac Spiders	x		
	Dysdera crocata	Woodlouse Spider	x		
	Intruda signata		x		
	Tamopsis sp.	Two-tailed Spiders	x		
	Lampona sp.	White-tailed Spiders	x		
	Portacosa cinerea		x		
	Venatrix pseudospeciosa		x		
	Australomimetus sp.		x		
	Miturgidae sp.	Prowling Spiders	x		
	Oxyopes amoenus	Farmland Lynx Spider	x		
	Oxyopes gracilipes	Graceful-legs Lynx	x		
	Stanwellia grisea	Melbourne Trapdoor Spider	x		
	Apricia jovialis	Jovial Jumping Spider	x		
	Helpis minitabunda	Bronze Hopper	x		
	Holoplatys tasmanensis		x		
	Jotus frosti	Frost's Jumping Spider	x		
	Maratus	Peacock Spiders	x		
	Maratus plumosus	Plumed Peacock Spider	x		
	Opisthoncus	Garden Jumping Spiders	x		
	Salticidae	Jumping Spiders	x		
	Simaethula sp.		x		
	Sondra sp.		x		
	Ariadna sp.	Tube-web Spiders	x		
	Isopedella victorialis	Victorian Huntsman Spider	x		
	Neosparassus diana	Badge Huntsman Spider	x		
	Tetragnatha sp.		x		
	Cryptachaea veruculata	Diamond Comb-footed Spider	x		
	Euryopis sp.	Ant-eating Spiders	x		
	Phoroncidia sextuberculata	Six-humped Shell-back Spider	x		
	Steatoda capensis	Black Cobweb Spider	x		
	Steatoda grossa	False Black Widow	x		
	Theridiidae	Cobweb Spiders	x		
	Australomisidia pilula	Lozenge-shaped Crab Spider	x		
	Cetratus rubropunctatus	Long Green Crab Spider	x		
	Hedana valida	Powerful Hedana	x		
	Sidymella sp.	Square-ended Crab Spiders	x		
	Sidymella trapezia	Trapezoid Crab Spider	x		

		Species Name	Common Name	Source		
				iNaturalist	VBA	FBRHS
		Thomisidae	Crab Spiders	x		
		Trochanteriidae	trochanteriid spiders	x		
		Philoponella congregabilis	Social House Spider	x		
		Pseudoscorpiones sp.	Pseudoscorpions	x		
		Rainbowia sp.		x		
		Hydrachnidia sp.	Water Mites	x		
Chilopods		*Cormocephalus*	Common Centipedes	x		
		Lithobius peregrinus	Peregrine's Stone Centipede	x		
Diplopods	*	*Ommatoiulus moreleti*	Portuguese Millipede	x		
		Polyxenus	Millipede	x		
Malacostracans		*Porcellio scaber*	Common Rough Woodlouse	x		
Collembola		*Entomobryidae*	Slender Springtails	x		
		Paronellides		x		
Gastropods	*	*Limacus flavus*	Yellow Cellar Slug	x		
Vertebrates						
Amphibians		*Anura*	Frogs and Toads	x		
Reptiles		*Acritoscincus duperreyi*	Eastern Three-lined Skink	x		
		Christinus marmoratus	Southern Marbled Gecko	x		
		Lampropholis guichenoti	Pale-flecked Garden Sunskink	x		
		Lerista bougainvillii	South-eastern Slider	x		
		Saproscincus mustelinus	Southern Weasel Skink	x		
Birds		*Accipiter cirrocephalus*	Collared Sparrowhawk		x	
		Accipiter fasciatus	Brown Goshawk		x	x
	*	*Agapornis roseicollis*	Rosy-headed Lovebird			x
		Acanthiza pusilla	Brown Thornbill	x	x	x
		Accipiter fasciatus	Brown Goshawk		x	x
	en	*Accipiter novaehollandiae*	Grey Goshawk		x	x
	*	*Acridotheres tristis*	Common Myna		x	x
	*	*Alauda arvensis*	Eurasian Skylark		x	x
		Alisterus scapularis	Australian King Parrot			x
		Anas superciliosa	Pacific Black Duck		x	x
		Anthochaera carunculata	Red Wattlebird	x	x	x
		Anthochaera chrysoptera	Little Wattlebird		x	x
		Acanthorhynchus tenuirostris	Eastern Spinebill		x	x

		Species Name	Common Name	Source		
				iNaturalist	VBA	FBRHS
		Cacatua galerita	Sulphur-crested Cockatoo		x	x
		Cacomantis pallidus	Pallid Cuckoo		x	x
		Cacatua sanguinea	Little Corella	x	x	x
		Cacomantis flabelliformis	Fan-tailed Cuckoo		x	x
		Caligavis chrysops	Yellow-faced Honeyeater		x	x
	*	*Carduelis carduelis*	European Goldfinch			x
		Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo	x		x
		Cincloramphus cruralis	Brown Songlark		x	
		Chenonetta jubata	Australian Wood Duck		x	
		Chroicocephalus novaehollandiae	Silver Gull		x	x
		Chrysococcyx basalis	Horsfield's Bronze-Cuckoo		x	x
		Chrysococcyx lucidus	Shining Bronze-Cuckoo		x	
		Colluricincla harmonica	Grey Shrike-thrush		x	x
	*	*Columba livia*	Domestic Pigeon		x	
		Coracina novaehollandiae	Black-faced Cuckoo-shrike		x	x
		Corvus coronoides	Australian Raven		x	
		Corvus mellori	Little Raven		x	x
		Cracticus torquatus	Grey Butcherbird	x	x	x
		Dacelo novaeguineae	Laughing Kookaburra		x	x
		Dicaeum hirundinaceum	Mistletoebird		x	x
		Elanus axillaris	Black-shouldered Kite		x	x
		Eolophus roseicapilla	Galah		x	x
		Eopsaltria australis	Eastern Yellow Robin			x
		Falco berigora	Brown Falcon		x	x
		Falco cenchroides	Nankeen Kestrel		x	x
		Falco longipennis	Australian Hobby		x	x
		Glossopsitta concinna	Musk Lorikeet	x	x	x
		Grallina cyanoleuca	Magpie-lark	x	x	x
		Gymnorhina tibicen	Magpie	x	x	x
		Hirundo neoxena	Welcome Swallow		x	x
		Lalage sueurii	White-winged Triller			x
	CR cr	*Lathamus discolor*	Swift Parrot		x	
		Malurus cyaneus	Superb Fairy-wren		x	x
		Manorina melanocephala	Noisy Miner	x	x	x
		Melanodryas cucullata	Hooded Robin			x
		Melithreptus lunatus	White-naped Honeyeater		x	
		Neophema chrysostoma	Blue-winged Parrot			x
		Ocyphaps lophotes	Crested Pigeon	x	x	x
		Pachycephala pectoralis	Golden Whistler		x	x
		Pachycephala rufiventris	Rufous Whistler		x	x
		Pardalotus punctatus	Spotted Pardalote		x	x
	*	*Passer domesticus*	House Sparrow		x	x

		Species Name	Common Name	Source		
				iNaturalist	VBA	FBRHS
	*	*Passer montanus*	Eurasian Tree Sparrow		x	
		Parvipsitta pusilla	Little Lorikeet		x	x
		Petroica phoenicea	Flame Robin		x	x
		Phaps chalcoptera	Common Bronzewing	x	x	x
		Phaps elegans	Brush Bronzewing		x	x
		Phylidonyris novaehollandiae	New Holland Honeyeater		x	x
		Platycercus eximius	Eastern Rosella	x	x	x
		Platycercus eximius eximius	White-cheeked rosella	x		
		Podargus strigoides	Tawny Frogmouth	x	x	x
		Ptilotula penicillata	White-plumed Honeyeater		x	x
		Rhipidura albiscapa	Grey Fantail		x	x
		Rhipidura leucophrys	Willie Wagtail		x	x
	MIG	*Rhipidura rufifrons*	Rufous Fantail		x	x
		Sericornis frontalis	White-browed Scrubwren		x	x
		Strepera graculina	Pied Currawong	x	x	x
	*	*Streptopelia chinensis*	Spotted Dove	x	x	x
	*	*Sturnus vulgaris*	Common Starling		x	x
		Todiramphus sanctus	Sacred Kingfisher		x	x
		Trichoglossus moluccanus	Rainbow Lorikeet	x	x	x
	*	*Turdus merula*	Common Blackbird	x	x	x
	*	*Turdus philomelos*	Song Thrush		x	x
		Tyto alba	Barn Owl			x
		Vanellus miles	Masked Lapwing		x	x
		Zosterops lateralis	Silvereye		x	x
		Zoothera lunulata	Bassian Thrush			x
Mammals		*Pseudocheirus peregrinus*	Eastern Ring-tail Possum	x	x	
		Trichosurus vulpecula	Common Brush-tailed Possum			x
	*	*Vulpes vulpes*	Red Fox			x
		Austronomus australis	White-striped Free-tailed Bat			x
		Chalinolobus gouldii	Gould's Wattled Bat			x
		Chalinolobus morio	Chocolate Wattled Bat			x
		Myotis macropus	Large-footed Myotis			x
	cr	*Miniopterus schreibersii oceanensis*	Common Bent-wing Bat			x
		Vespadelus vulturnus	Little Forest Bat			x

Appendix B

Flora taxa previously recorded within Bay Road Heathland Sanctuary

Key:
FoBRHS – Friends of the Bay Road Heathland Sanctuary
VBA – Victorian Biodiversity Atlas
* – introduced

Scientific Name/ Taxon group	Status	Species name	Common name	Source		
				iNaturalist	VBA	FBRHS
Non-vascular plants						
Mosses		*Barbula calycina*		x		
		Bryum sp.	Thread Moss		x	
		Campylopus introflexus	Heath Star-moss	x		
		Hypnum cupressiforme	Cypress-leaved Plait-moss	x		
	*	*Pseudoscleropodium purum*	Neat Feather-moss	x	x	
		Thuidiopsis furfurosa		x		
		Polytrichum juniperinum	Juniper Haircap	x	x	
Liverworts		*Chaetophyllopsis whiteleggei*	Grey Woollywort		x	
		Chiloscyphus semiteres	Flat-fern Liverwort	x		
Lichens		*Cladia aggregata*	Common Coral-lichen		x	
		Teloschistes chrysophthalmus	Golden-eye Lichen		x	
Fungi		*Schizophyllum commune*	Splitgill mushroom		x	
Vascular plants - ferns						
Dennstaedtiaceae		*Pteridium esculentum* subsp. *esculentum*	Austral Bracken	x	x	
Pteridaceae		*Cheilanthes austrotenuifolia*	Green Rock-fern	x	x	
Vascular plants - monocots						
Colchicaceae		*Burchardia umbellata*	Milkmaids	x	x	
Asphodelaceae		*Caesia parviflora* var. *parviflora*	Pale Grass-lily	x	x	
		Chamaescilla corymbosa var. *corymbosa*	Blue Stars	x	x	
		Dianella brevicaulis	Small-flower flax-lily			x
		Dianella revoluta var. *revoluta*	Black-anther flax-lily	x	x	
		Thysanotus patersonii	Twining Fringe-lily	x	x	
		Xanthorrhoea minor subsp. *lutea*	Small Grass-tree	x	x	
Asparagaceae	*	*Asparagus asparagoides*	Bridal Creeper		x	
		Arthropodium strictum	Chocolate lily	x	x	
		Laxmannia orientalis	Dwarf wire-lily	x	x	
		Lomandra filiformis	Wattle mat-rush	x	x	
		Lomandra longifolia	Spiny-headed Mat-rush	x	x	
		Lomandra multiflora	Many Flowered Matrush	x		
		Thysanotus patersonii	Twining Fringe-lily	x	x	
Iridaceae	*	*Ixia polystachya polystachya*	African Corn Lily	x	x	
	*	*Freesia leichtlinii*	Freesia		x	
	*	*Romulea rosea*	Onion Grass		x	
Alliaceae	*	*Allium triquetrum*	Angled Onion		x	
Orchidaceae		*Caladenia carnea*	Pink Lady Fingers	x		
		Glossodia major	Waxlip Orchid	x		

		Microtis parviflora	Slender onion-orchid	x		
		Microtis unifolia	Common onion-orchid	x	x	
		Pterostylis concinna	Trim Greenhood	x	x	
		Pterostylis nutans	Nodding Greenhood	x		
		Thelymitra brevifolia	Peppertop Sun-orchid	x		
Poaceae	*	*Agrostis capillaris*	Brown-top Bent		x	
	*	*Aira caryophyllea* subsp. *caryophyllea*	Silvery Hair-grass		x	
	*	*Aira elegantissima*	Delicate Hair-grass		x	
	*	*Aira praecox*	Early Hair-grass		x	
	*	*Anthoxanthum odoratum*	Sweet Vernal-grass		x	
		Austrostipa flavescens	Coast Spear-grass		x	
		Austrostipa mollis	Supple Spear-grass	x	x	
		Austrostipa semibarbata	Fibrous Spear-grass		x	
	*	*Briza maxima*	Large Quaking-grass		x	
	*	*Bromus catharticus*	Prairie Grass		x	
	*	*Cenchrus clandestinus*	Kikuyu		x	
	*	*Cynodon dactylon* var. *dactylon*	Couch		x	
	*	*Dactylis glomerata*	Cocksfoot		x	
		Deyeuxia quadriseta	Reed Bent-grass		x	
		Dichelachne crinita	Long-hair Plume-grass	x	x	x
	*	*Ehrharta erecta*	Panic Veldt-grass		x	
	*	*Ehrharta longiflora*	Annual Veldt-grass		x	
		Eragrostis brownii	Common Love-grass		x	
	*	*Holcus lanatus*	Yorkshire Fog		x	
		Microlaena stipoides var. *stipoides*	Weeping Grass		x	x
	*	*Poa annua s.l.*	Annual Meadow-grass		x	
		Poa clelandii	Noah's Ark		x	
		Poa labillardierei var. *labillardierei*	Common Tussock-grass			x
		Poa poiformis	Coast Tussock-grass		x	
		Poa sieberiana	Grey Tussock-grass		x	
		Rytidosperma geniculatum	Kneed Wallaby-grass		x	x
		Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass		x	x
		Rytidosperma setaceum	Bristly Wallaby-grass		x	x
	*	*Sporobolus africanus*	Rat-tail Grass		x	
		Themeda triandra	Kangaroo Grass		x	x
	*	*Vulpia sp.*	Fescue		x	
Cyperaceae		*Isolepis marginata*	Little Club-sedge		x	
		Lepidosperma sieberi	Sandhill Sword-sedge		x	
		Schoenus apogon	Common Bog-sedge		x	
		Ficinia nodosa	Knobby Club-sedge		x	

Restionaceae		*Hypolaena fastigiata*	Tassel Rope-rush		x	x
		Lepyrodia muelleri	Common Scale-rush		x	
Juncaceae		*Juncus pallidus*	Pale Rush		x	
Cyperaceae		*Lepidosperma sieberi*	Sandhill Sword-sedge		x	
		Ficinia nodosa	Knobby Club-sedge		x	x
		Schoenus apogon	Common Bog-sedge		x	
		Isolepis marginata	Little Club-sedge		x	
Vascular plants - dicots						
Proteacea		*Banksia integrifolia* subsp. *integrifolia*	Coast Banksia		x	
		Banksia marginata	Silver Banksia	x	x	
		Isopogon ceratophyllus	Horny Cone-bush		x	
Asteraceae	*	*Sonchus oleraceus*	Common Sow-thistle		x	
	*	*Arctotheca calendula*	Cape Weed		x	
		Cassinia aculeata subsp. *aculeata*	Common Cassinia		x	
	*	*Cassinia sifton*	Sifton Bush	x		
	#	*Cotula australis*	Australian Waterbuttons	x		
		Coronidium scorpioides	Button Everlasting			x
	*	*Erigeron bonariensis*	Flaxleaf Fleabane		x	
	*	*Hypochaeris glabra*	Smooth Cat's-ear		x	
	*	*Hypochaeris radicata*	Flatweed		x	
		Lagenophora stipitata	Blue Bottle-daisy		x	
	*	*Leontodon saxatilis* subsp. *saxatilis*	Hairy Hawkbit		x	
		Olearia axillaris	Coast Daisy-Bush		x	
		Olearia glutinosa	Sticky Daisy-bush		x	
		Olearia ramulosa	Twiggy Daisy-bush	x	x	
		Senecio hispidulus	Rough Fireweed		x	
		Senecio quadridentatus	Cotton Fireweed	x	x	
Goodeniaceae		*Goodenia geniculata*	Bent Goodenia	x	x	
		Goodenia radicans	Shiny Swamp-mat		x	
Stylidiaceae		*Stylidium graminifolium*	Grass Triggerplant	x	x	
Lauraceae		*Cassytha glabella*	Slender Dodder-laurel		x	
		Cassytha pubescens	Downy Dodder-laurel		x	
Casuarinaceae		*Allocasuarina pusilla*	Dwarf Sheoak		x	
		Allocasuarina paradoxa	Green Sheoak	x	x	
		Allocasuarina littoralis	Black Sheoak	x	x	
		Allocasuarina verticillata	Drooping Sheoak		x	x
		Allocasuarina paludosa	Scrub Sheoak		x	
Fabaceae		*Acacia implexa*	Lightwood		x	
	*	*Acacia iteaphylla*	Flinder's Range Wattle	x		
	#	*Acacia longifolia* subsp. *longifolia*	Sallow Wattle	x	x	

	#	*Acacia longifolia* subsp. *sophorae*	Coast Wattle		x	
		Acacia longifolia subsp. *sophorae x oxycedrus*	Coast Wattle x Spike Wattle hybrid		x	
		Acacia mearnsii	Black Wattle	x	x	
		Acacia oxycedrus	Spike Wattle	x	x	
		Acacia paradoxa	Hedge Wattle	x	x	
		Acacia stricta	Hop Wattle		x	
		Acacia suaveolens	Sweet Wattle	x	x	
		Acacia ulicifolia	Juniper Wattle	x	x	
		Acacia verticillata	Prickly Moses		x	
		Aotus ericoides	Common Aotus	x	x	
		Bossiaea cinerea	Showy Bossiaea	x	x	
		Bossiaea prostrata	Creeping Bossiaea		x	
	*	*Chamaecytisus palmensis*	Tree Lucerne		x	
		Dillwynia glaberrima	Smooth Parrot-pea	x	x	
	*	*Dipogon lignosus*	Common Dipogon		x	
	*	*Genista monspessulana*	Montpellier Broom		x	
		Gompholobium ecostatum	Dwarf Wedge-pea		x	
		Hardenbergia violacea	Purple Coral-pea		x	
		Indigofera australis subsp. australis	Austral Indigo		x	
		Kennedia prostrata	Running Postman		x	x
	*	*Medicago polymorpha*	Burr Medic		x	
	*	*Paraserianthes lophantha subsp. lophantha*	Cape Wattle		x	
		Platylobium obtusangulum	Common Flat-pea	x	x	
	*	*Trifolium arvense var. arvense*	Hare's-foot Clover		x	
	*	*Trifolium repens var. repens*	White Clover		x	
	*	*Ulex europaeus*	Gorse		x	
Polygalaceae		*Comesperma volubile*	Love Creeper		x	
Rutaceae		*Correa alba*	White Correa		x	
		Correa reflexa	Common Correa	x	x	
Crassulaceae		*Crassula decumbens var. decumbens*	Spreading Crassula	x	x	
		Crassula sieberiana	Sieber Crassula	x	x	
Haloragaceae		*Gonocarpus tetragynus*	Common Raspwort	x	x	
		Gonocarpus micranthus subsp. micranthus	Creeping Raspwort		x	
		Myriophyllum crispatum	Upright Water-milfoil			x
Myrtaceae	#	*Eucalyptus botryoides*	Southern Mahogany		x	
		Eucalyptus camaldulensis	River Red-gum		x	
	*	*Eucalyptus conferruminata*	Bald Island Marlock	x		
		Eucalyptus ovata	Swamp Gum		x	
	#	*Eucalyptus pauciflora*	Snow Gum			x

		Eucalyptus viminalis subsp. *pryoriana*	Coast Manna-gum		x	x
		Kunzea leptospermoides	Burgan	x	x	
		Leptospermum continentale	Prickly Tea-tree	x	x	
	#	*Leptospermum laevigatum*	Coast Tea-tree	x	x	
		Leptospermum laevigatum x myrsinoides	Coast Tea-tree x Heath Tea-tree hybrid		x	
		Leptospermum myrsinoides	Heath Tea-tree		x	
		Leptospermum scoparium	Manuka	x		
Caryophyllaceae	*	*Silene* sp.	Catchfly		x	
	*	*Stellaria media*	Chickweed		x	
Polygonaceae	*	*Acetosella vulgaris*	Sheep Sorrel		x	
		Muehlenbeckia adpressa	Climbing Lignum		x	x
Aizoaceae		*Tetragonia implexicoma*	Bower Spinach		x	
Chenopodiaceae		*Einadia nutans* subsp. *nutans*	Nodding Saltbush	x		
		Rhagodia candolleana subsp. *candolleana*	Seaberry Saltbush	x	x	
Euphorbiaceae		*Amperea xiphoclada* var. *xiphoclada*	Broom Spurge	x	x	
		Ricinocarpos pinifolius	Wedding Bush	x	x	
Rubiaceae		*Coprosma quadrifida*	Prickly Currant-bush			x
	*	*Galium aparine*	Cleavers		x	
		Opercularia ovata	Broad-leaf Stinkweed		x	
		Opercularia varia	Variable Stinkweed	x	x	
Pittosporaceae		*Bursaria spinosa* subsp. *spinosa*	Sweet Bursaria	x	x	
	#	*Pittosporum undulatum*	Sweet Pittosporum		x	
Araliaceae		*Hydrocotyle hirta*	Hairy Pennywort		x	
Apiaceae		*Platysace heterophylla* var. *heterophylla*	Slender Platysace		x	
Dilleniaceae		*Hibbertia fasciculata* var. *prostrata*	Bundled Guinea-flower	x	x	
		Hibbertia riparia	Erect Guinea-flower		x	
		Hibbertia sericea	Silky Guinea-flower	x	x	
Oxalidaceae		*Oxalis corniculata*	Yellow Wood-sorrel		x	
	*	*Oxalis corniculata*	Creeping Wood-sorrel		x	
	*	*Oxalis incarnata*	Pale Wood-sorrel		x	
		Oxalis perennans	Grassland Wood-sorrel	x	x	
	*	*Oxalis pes-caprae*	Soursob		x	
	*	*Oxalis purpurea*	Large-flower Wood-sorrel		x	
Solanaceae	*	*Lycium ferocissimum*	African Box-thorn		x	
	*	*Salpichroa origanifolia*	Pampas Lily-of-the-Valley	x	x	
		Solanum aviculare	Kangaroo Apple		x	
		Solanum laciniatum	Large Kangaroo Apple	x	x	
	*	*Solanum nigrum*	Black Nightshade		x	

Convolvulaceae		*Dichondra repens*	Kidney-weed		x	x
Thymelaeaceae		*Pimelea humilis*	Common Rice-flower		x	
		Pimelea phylicoides	Heath Rice-flower		x	
Geraniaceae		*Erodium* sp.	Heron's Bill		x	
		Geranium sp.	Crane's Bill		x	
		Pelargonium australe	Austral Stork's-bill		x	
	*	*Pelargonium X domesticum*	Regal Pelargonium		x	
	*	*Pelargonium X asperum*	Rose-oil Geranium		x	
Rhamnaceae		*Pomaderris paniculosa* subsp. *paralia*	Coast Pomaderris		x	
Rosaceae	*	*Rubus fruticosus* spp. agg.	Blackberry		x	
Ericaceae		*Acrotriche serrulata*	Honey-pots	x		
		Epacris impressa	Common Heath		x	x
		Leucopogon parviflorus	Coast Beard-heath		x	
		Leucopogon virgatus	Common Beard-heath	x	x	
		Monotoca scoparia	Prickly Broom-heath	x	x	
		Styphelia humifusa	Cranberry Heath		x	
Commelinaceae	*	*Tradescantia fluminensis*	Wandering Jew		x	
Ranunculaceae		*Clematis microphylla*	Small-leaved Clematis	x	x	
Fumariaceae	*	*Fumaria capreolata*	White Fumitory		x	
Scrophulariaceae	#	*Myoporum insulare*	Common Boobialla		x	
Loranthaceae		*Muellerina eucalyptoides*	Creeping Mistletoe	x	x	

Appendix C

Plant taxa recording within the project area

	Species	Common Name
	Acacia implexa	Lightwood
#	*Acacia longifolia* subsp. *sophorae*	Coast Wattle
	Acacia mearnsii	Black Wattle
	Acacia oxycedrus	Spike Wattle
	Acacia paradoxa	Hedge Wattle
*	*Acetosella vulgaris*	Sheep Sorrel
*	*Agrostis capillaris*	Brown-top Bent
*	*Aira caryophyllea* subsp. *caryophyllea*	Silvery Hair-grass
	Allocasuarina paludosa	Scrub Sheoak
	Allocasuarina verticillata	Drooping Sheoak
*	*Anthoxanthum odoratum*	Sweet Vernal-grass
*	*Arctotheca calendula*	Cape Weed
*	*Asparagus asparagoides*	Bridal Creeper
	Banksia integrifolia subsp. *integrifolia*	Coast Banksia
	Banksia marginata	Silver Banksia
*	*Bromus catharticus*	Prairie Grass
*	*Bromus diandrus*	Great Brome
	Bursaria spinosa subsp. spinosa (tree form)	Sweet Bursaria
*	*Casuarina cunninghamiana* subsp. *cunninghamiana*	River Oak
*	*Cenchrus clandestinus*	Kikuyu
*	*Cerastium glomeratum*	Common Mouse-ear Chickweed
*	*Cinnamomum camphora*	Camphor laurel
*	*Cirsium vulgare*	Spear Thistle
	Clematis microphylla s.s.	Small-leaved Clematis
*	*Coprosma repens*	Mirror Bush
*	*Corymbia ficifolia*	Red-flowering Gum
*	*Cotoneaster glaucophyllus*	Large-leaf Cotoneaster
*	*Cynodon dactylon* var. *dactylon*	Couch
*	*Dactylis glomerata*	Cocksfoot
	Dianella revoluta s.l.	Black-anther Flax-lily
	Dichondra repens	Kidney-weed
*	*Ehrharta erecta*	Panic Veldt-grass
*	*Ehrharta longiflora*	Annual Veldt-grass
*	*Erigeron bonariensis*	Flaxleaf Fleabane
	Eucalyptus botryoides	Southern Mahogany
	Eucalyptus camaldulensis	River Red-gum
*	*Eucalyptus conferruminata*	Bald Island Marlock
	Eucalyptus radiata subsp. *radiata*	Narrow-leaf Peppermint
	Eucalyptus tricarpa	Red Ironbark
	Eucalyptus viminalis subsp. *viminalis*	Manna Gum
	Eucalyptus viminalis subsp. *pryoriana*	Coast Manna-gum
*	*Fraxinus angustifolia*	Desert Ash
*	*Fumaria capreolata*	White Fumitory
*	*Galenia pubescens* var. *pubescens*	Galenia
*	*Galium aparine*	Cleavers
*	*Genista monspessulana*	Montpellier Broom

*	*Geranium molle*	Dove's Foot
*	*Hakea drupacea*	Sweet Hakea
*	*Hedera helix*	English Ivy
*	*Helminthotheca echioides*	Ox-tongue
*	*Hesperocyparis macrocarpa*	Monterey Cypress
*	*Holcus lanatus*	Yorkshire Fog
*	*Hordeum leporinum*	Barley-grass
*	*Hypochaeris radicata*	Flatweed
*	*Kunzea leptospermoides*	Burgan
*	*Lactuca serriola*	Prickly Lettuce
*	*Lepidium africanum*	Common Peppercress
	Leptospermum laevigatum	Coast Tea-tree
*	*Lolium perenne*	Perennial Rye-grass
	Lomandra longifolia	Spiny-headed Mat-rush
*	*Lophostemon confertus*	Brush Box
*	*Lycium ferocissimum*	African Box-thorn
*	*Lysimachia arvensis* var. *arvensis*	Scarlet Pimpernel
*	*Medicago polymorpha*	Burr Medic
	Microlaena stipoides var. *stipoides*	Weeping Grass
	Myoporum insulare	Common Boobialla
*	*Oxalis pes-caprae*	Soursob
*	*Paspalum dilatatum*	Paspalum
*	*Plantago coronopus*	Buck's-horn Plantain
*	*Plantago lanceolata*	Ribwort
*	*Poa annua*	Annual Meadow-grass
*	*Populus* sp.	Poplar
	Pteridium esculentum subsp. *esculentum*	Austral Bracken
	Rhagodia candolleana subsp. *candolleana*	Seaberry Saltbush
*	*Romulea rosea*	Onion Grass
*	*Salpichroa origanifolia*	Pampas Lily-of-the-Valley
*	*Senecio vulgaris*	Common Groundsel
*	*Sonchus asper*	Rough Sow-thistle
*	*Sonchus oleraceus*	Common Sow-thistle
*	*Sporobolus africanus*	Rat-tail Grass
*	*Stellaria media*	Chickweed
*	*Taraxacum officinale* spp. agg.	Garden Dandelion
	Tetragonia implexicoma	Bower Spinach
*	*Tradescantia fluminensis*	Wandering Tradescantia
*	*Trifolium angustifolium* var. *angustifolium*	Narrow-leaf Clover
*	*Trifolium arvense* var. *arvense*	Hare's-foot Clover
*	*Trifolium dubium*	Suckling Clover
*	*Trifolium glomeratum*	Cluster Clover
*	*Trifolium repens* var. *repens*	White Clover
*	*Vulpia bromoides*	Squirrel-tail Fescue