

**951 YANNATHAN ROAD, 30 GLOVERS ROAD &
379 LANG LANG-POOWONG ROAD, NYORA**

FLORA & FAUNA ASSESSMENT



**Consultant report for: Wallis Watson (Nyora) Pty Ltd
C/ Beveridge Williams**



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1. EXECUTIVE SUMMARY

1.1. Introduction

On behalf of Wallis Watson (Nyora) Pty Ltd, Beveridge Williams engaged Brett Lane & Associates Pty Ltd (BL&A) to conduct a flora and fauna assessment of a 103 hectare area of land in Nyora. The specific area investigated, referred to herein as the ‘study area’, comprised three large private lots defined in the planning scheme as 951 Yannathan Road, 30 Glovers Road and 379 Lang Lang-Poowong Road, Nyora, as well as adjoining road reserves (Figure 1). Residential subdivision is proposed for the study area.

This investigation was commissioned to provide information on the extent and condition of native vegetation in the study area according to Victoria’s *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a), as well as information on flora and fauna matters listed under the state *Flora and Fauna Guarantee Act 1988* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Access was not granted to the two smaller lots in the western section of the study area (951 Yannathan Road and 30 Glovers Road). Therefore, information presented on these two lots was limited to a combination of desktop assessment and observation from the neighbouring property and adjacent public roads.

1.2. Assessment results

1.2.1. General descriptions of existing conditions in properties assessed

379 Lang Lang-Poowong Road (full access)

An occupied dwelling and associated outbuildings occurred on the highest point of the largest lot in the study area, 379 Lang Lang-Poowong Road. The property comprised of open grassy paddocks with scattered paddock trees, as well as fenced off treed areas. The property exhibited a long history of grazing, with dairy cattle observed grazing the paddocks at the time of the survey. The open paddocks throughout the study area were comprised of introduced pasture grasses and broadleaf weeds, namely Cape Weed. The history of cattle grazing throughout the paddocks has resulted in the ground layer being heavily pugged, especially in the lower lying areas.

A main drainage line ran diagonally through the property, with an offshoot running into a large dam. Several dead trees (stags) occurred in the western end of this dam, while the southern and western boundaries were lined with dense stands of Swamp Paperbark. Several additional small dams occurred throughout the property, all of which lacked fringing vegetation.

Treed sections of the study area were well fenced (limiting grazing by cattle) and supported a range of vegetation types from Lowland Forest along the eastern and northern boundary of the study area to Swampy Riparian Woodland and Swamp Scrub along the drainage lines.

Various plantings were observed throughout the property. While some planted treelines were considered to be mainly for the purpose of windbreaks or aesthetic value, plantings along the main drainage lines comprised appropriate indigenous species and enhanced the understorey of otherwise remnant vegetation (remnant Swamp Gum and Swamp Paperbark along the drainage lines).

The results of the detailed assessment of native vegetation undertaken at 379 Lang Lang-Poowong Road is provided in Section 5.2.

30 Glovers Road (no direct access)

No dwellings occurred on the property at 30 Glovers Road. The majority of the property was being grazed by cattle, largely comprising open paddocks dominated by introduced pasture. The treed area in the north-east section of the property was considered likely to comprise Lowland Forest (EVC 16), being contiguous with similar vegetation to the east at 379 Lang Lang-Poowong Road (HZ E). While the canopy was similar, the vegetation at 30 Glovers Road was considered likely to have a lower habitat score due to a much sparser understorey.

Several additional remnant canopy trees occurred in the paddocks, some of which occurred in clusters and would be considered as remnant patches, others which occur separately and would be considered as scattered trees.

951 Yannathan Road (no direct access)

A dwelling and associated buildings occurred on the smallest property in the study area, 951 Yannathan Road. Vegetation at this property appeared to comprise of a mixture of planted garden species and remnant native vegetation.

1.2.2. Habitat hectare assessment results

13 patches of native vegetation (referred to herein as habitat zones), comprising Lowland Forest (EVC 16), Swamp Scrub (EVC 53) and Swampy Riparian Woodland (EVC 83), were identified within the property at 379 Lang Lang-Poowong Road, Nyora (total area of 12.89 hectares), including a total of 80 large trees in patches.

A total of 34 scattered trees occurred within the property at 379 Lang Lang-Poowong Road, Nyora, of which would have once comprised the canopy component of Lowland Forest (EVC 16) or Swampy Riparian Woodland (EVC 83). 18 of these scattered trees were in the large size class and the remaining 16 were in the small size class.

1.2.3. Targeted flora and fauna survey results

Targeted flora surveys

A targeted flora survey was undertaken on 19th July 2018 to determine the status of Green-striped Greenhood and Strzelecki Gum in parts of the study area that will likely be subject to impacts on native vegetation (as depicted in Figure 3 below).

Neither Green-striped Greenhood or Strzelecki Gum were detected during the targeted flora surveys in July 2018, within the survey area depicted in Figure 3. Therefore, both of these species are now considered unlikely to occur in those areas of native vegetation, but may occur outside of the Figure 3 survey area, which is unlikely to be impacted by the proposed development.

Targeted surveys for Giant Gippsland Earthworm and Dwarf Galaxias

The following targeted surveys were undertaken by specialist consultants within accessible parts of the study area:

- Targeted survey for Dwarf Galaxias – undertaken by Aquatica Environmental on 29th and 30th August 2017 (Aquatica Environmental 2017; Appendix 8); and

- Targeted survey for Giant Gippsland Earthworm – undertaken by Invert-Eco on 21st August 2017 (Invert-Eco 2017; Appendix 9).

The results of both targeted surveys were negative and both of these species are now considered unlikely to occur in the study area.

For a full account of the survey results, see appendices 8 and 9.

Southern Brown bandicoot targeted survey

A targeted survey for Southern Brown Bandicoot was undertaken between August and September 2018. The results of the survey were negative, Southern Brown Bandicoot was not detected through the use of either camera traps or hair tubes and hair analysis over two separate survey periods over a month apart. It is therefore considered unlikely that Southern Brown Bandicoot is resident in the study area.

Unexpectedly, Swamp Antechinus (vulnerable under EPBC Act & threatened under FFG Act) was detected through hair analysis during the first round of the survey at one of the hair tube stations. This species was not initially considered to potentially occur in the study area, as the habitat there was considered marginal and there were no recent records of the species in the search region.

See Figure 5 for the location of the hair tube station where Swamp Antechinus was detected. The species was not detected again during the remainder of the targeted survey.

It is possible that Swamp Antechinus occurs in all large contiguous habitat zones in the study area, particularly habitat zones associated with the drainage system and Habitat Zone E.

1.3. Regulatory implications

1.3.1. Permit requirements

A planning permit under Clause 52.17 of the South Gippsland Planning Scheme is required for the removal of native vegetation.

1.3.2. Implications under the Guidelines

Avoid and minimise statement

An avoid and minimise statement is provided in section 7.2.1 of this report.

Assessment pathway

According to the Guidelines, the proposal is to be assessed under the **Detailed** assessment pathway.

The proposal **would** trigger a referral to DELWP based on the criteria specified in Section 3.2.3. of this report.

Offset requirements

Offsets required to compensate for the proposed removal of native vegetation from the study area are provided below.

- 2.717 *general habitat units* and must include the following offset attribute requirements:
 - Minimum strategic biodiversity value (SBV) of 0.353;
 - Occur within the Port Phillip and Westernport CMA boundary or South Gippsland Shire municipal district; and
 - Include protection of at least 59 large trees.

Under the Guidelines all offsets must be secured prior to the removal of native vegetation.

Offset statement

It is recommended that the offset requirements for the current proposal be met via purchase of a third-party offset through DELWP's Native Vegetation Credit Register (NVCR).

DELWP accredited native vegetation brokers advise that the general offset units and large trees are readily available for trade through the NVCR.

1.3.3. *Implications under the EPBC Act*

Based on the relevant guidelines, the proposed development is considered **unlikely** to result in a significant impact on the EPBC Act listed species Swamp Antechinus, which was recorded at one hair tube survey station in the study area.

It is possible that Swamp Antechinus occurs in all large contiguous habitat zones in the study area, particularly habitat zones associated with the drainage system and Habitat Zone E. As all habitat zones associated with the drainage system are proposed to be removed, the development will have an impact on this species.

Implications under the EPBC act for impacts on Swamp Antechinus as a result of the proposed development are currently being assessed in consultation with the proponent.

Significant impacts for all other species deemed to potentially occur in the study area are considered unlikely.

1.3.4. Implications under the FFG Act

The vast majority of land addressed in this assessment is private land, where the FFG Act does not apply in this instance. Public land in the study area comprised the adjoining reserve of Lang Lang-Poowong Road. No FFG Act listed values were recorded in the section of road reserve, therefore, a Protected Flora Licence or Permit under the FFG Act would not be required for the current proposal.

1.3.5. Implications under the Environment Effects Act 1978 (EE Act)

Based on the relevant criteria, a Referral to the state Minister for Planning will not be required under the EE Act for the aspects covered by the current investigation.

1.3.6. Implications under the Catchment and Land Protection Act 1994 (CaLP Act)

In accordance with the CaLP Act, the noxious weed species listed below, which were recorded in the study area, must be controlled.

- Blackberry; and
- Bulbil *Watsonia*.

Precision control methods that minimise off-target kills (e.g. spot spraying) should be used in environmentally sensitive areas (e.g. within or near native vegetation, waterways, etc.).

1.4. Mitigation recommendations

Recommendations to mitigate impacts on vegetation during construction are provided below:

- Establish appropriate vegetation protection zones around areas of native vegetation to be retained prior to works;
- Ensure all construction personnel are appropriately briefed prior to works, and that no construction personnel, machinery or equipment are placed inside vegetation/tree protection zones; and
- Have a suitably qualified zoologist on site during any tree removal works to capture and relocate and misplaced fauna that may be present.

2. INTRODUCTION

On behalf of Wallis Watson (Nyora) Pty Ltd, Beveridge Williams engaged Brett Lane & Associates Pty Ltd (BL&A) to conduct a flora and fauna assessment of a 103-hectare area of land in Nyora. The specific area investigated, referred to herein as the ‘study area’, comprised three large private lots defined in the planning scheme as 951 Yannathan Road, 30 Glovers Road and 379 Lang Lang-Poowong Road, Nyora, as well as adjoining road reserves (Figure 1). Residential subdivision is proposed for the study area.

This investigation was commissioned to provide information on the extent and condition of native vegetation in the study area according to Victoria’s *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a), as well as any potential impacts on flora and fauna matters listed under the state *Flora and Fauna Guarantee Act 1988* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This report outlines any implications under relevant national, state and local legislation and policy frameworks.

Access was not granted to the two smaller lots in the western section of the study area (951 Yannathan Road and 30 Glovers Road). Therefore, information presented on these two lots was limited to a combination of desktop assessment and observation from the neighbouring property and adjacent public roads.

Specifically, the scope of the investigation included:

- A review of existing information on the flora, fauna and native vegetation of the study area and surrounds, including:
 - Victorian Biodiversity Atlas administered by the Department of Environment, Land, Water and Planning (DELWP);
 - The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool; and
 - DELWP Native Vegetation Information Management system (NVIM).
- A site survey (limited to the property at 379 Lang Lang-Poowong Road, Nyora) involving:
 - Characterisation and mapping of native vegetation on the site, as defined in Victoria’s *Guidelines for the removal, destruction or lopping of native vegetation* (the ‘Guidelines’);
 - Assessment of native vegetation in accordance with the Guidelines, including habitat hectare assessment and/or scattered tree assessment;
 - Compilation of flora and fauna species lists for the site;
 - Assessment of the nature and quality of native fauna habitat;
 - Assessment of the likelihood of occurrence of EPBC Act and *Flora and Fauna Guarantee Act 1988* (FFG Act) listed flora, fauna and communities on the site; and
 - Targeted surveys for listed threatened species, where required.

This report is divided into the following sections:

Section 3 provides the legislative background including details of all relevant Commonwealth, State and local legislation and policies.

Section 4 describes the sources of information, including the methods used for the field survey.

Section 5 presents the assessment results, including details of the native vegetation, flora and fauna of the study area.

Section 6 discusses the proposed impacts of the project.


Section 7 details the implications of the findings under the relevant legislation and policy.

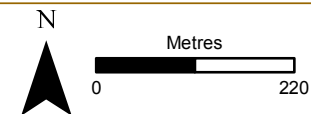
This investigation was undertaken by a team from BL&A, comprising Justin Sullivan (Senior Ecologist) and Brett Macdonald (Senior Ecologist & Project Manager).

Figure 1: Study area and properties

Project: NYORA-POOWONG RD, NYORA
Client: Beveridge Williams
Date: 18/01/2018

Legend

 Study area



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3. PLANNING AND LEGISLATIVE CONSIDERATIONS

This investigation and report addresses the application on the site of relevant legislation and planning policies that protect biodiversity. Local, state and Commonwealth controls are summarised below.

3.1. Local planning provisions

The study area is located within the South Gippsland local government area and is currently zoned Farming Zone (FZ) and General Residential Zone - Schedule 1 (GRZ1).

Local planning provisions apply under the Victorian *Planning and Environment Act 1987*.

3.1.1. Overlays

The entire study area is subject to Development Plan Overlay – Schedule 10 (DPO10) in the South Gippsland Planning Scheme. This overlay requires that a flora and fauna report be prepared as part of any development plan for the site.

A portion of the property at 379 Lang Lang-Poowong Road, Nyora is covered by the Bushfire Management Overlay (BMO), as depicted in Figure 2 below. The entire study area occurs within a Bushfire-prone Area. These overlays require that a Bushfire Management Statement (BMS) be prepared as part of any development plan for the site, in accordance with the requirements of Clause 43.02 (Bushfire Planning) and Clause 13.03 (Bushfire) in the South Gippsland Planning Scheme. A BMS has been prepared as stand-alone BL&A Report 17032 (3.0) (BL&A 2018b), which will accompany the planning application.

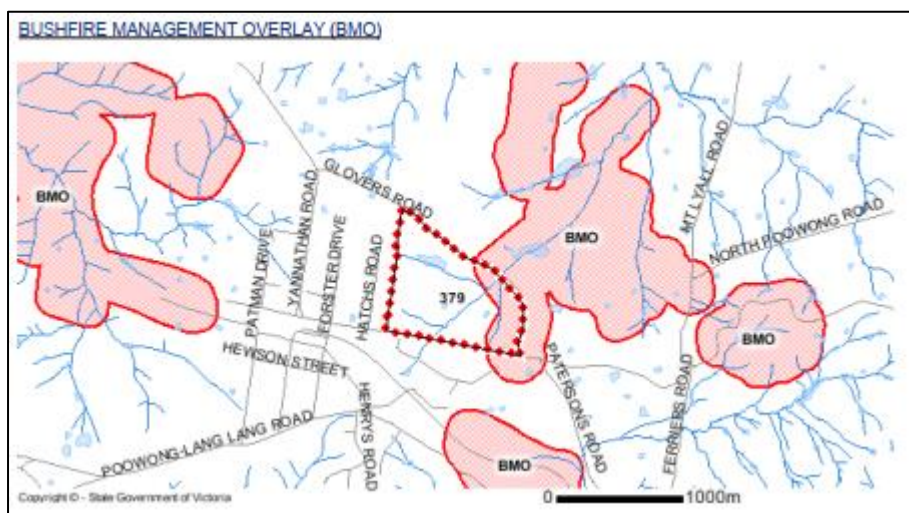


Figure 2: Extent of the BMO in the study area

3.2. State planning provisions

State planning provisions are established under the Victorian *Planning and Environment Act 1987*.

Clause 52.17 of all Victorian Planning Schemes states that:

A permit is required to remove, destroy or lop native vegetation, including dead native vegetation.

A permit is not required if:

- If an exemption in Table 52.17-7 specifically states that that a permit is not required.
- If a native vegetation precinct plan corresponding to the land is incorporated into the planning scheme and listed in the schedule to Clause 52.16.
- If the native vegetation is specified in a schedule to Clause 52.17.

3.2.1. Exemptions

No exemptions to Clause 52.17 are relevant to this project.

3.2.2. Application requirements

Any application to remove, destroy or lop native vegetation must comply with the application requirements specified in the Guidelines (DELWP 2017a).

When assessing an application, Responsible Authorities are also obligated to refer to Clause 12.01-2 (Native vegetation management) in the Planning Scheme which in addition to the Guidelines, refers to the following:

- *Assessor's handbook – applications to remove, destroy or lop native vegetation; and*
- Statewide biodiversity information maintained by DELWP.

The application of the Guidelines (DELWP 2017a) are explained further in Appendix 1.

3.2.3. Referral to DELWP

Clause 66.02-2 of the planning scheme determines the role of DELWP in the assessment of native vegetation removal permit applications. If an application is referred, DELWP may make certain recommendations to the responsible authority in relation to the permit application.

Any application to remove, destroy or lop native vegetation must be referred to DELWP if:

- The impacts to native vegetation is in the Detailed Assessment Pathway;
- A property vegetation plan applies to the site; or
- The native vegetation is on Crown land which is occupied or managed by the responsible authority.

3.3. EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* protects a number of threatened species and ecological communities that are considered to be of national conservation significance. Any significant impacts on these species require the approval of the Australian Minister for the Environment.

Implications under the EPBC Act for the current proposal are discussed in Section 7.3.

3.4. FFG Act

The Victorian *Flora and Fauna Guarantee Act 1988* lists threatened and protected species and ecological communities (DELWP 2017d, DELWP 2017e). Any removal of protected flora, which includes threatened flora species and the plants that make up threatened communities, listed under the FFG Act from public land requires a Protected Flora Licence or Permit under the Act, obtained from DELWP.

The FFG Act only applies to private land where a license is required to remove grass trees, tree ferns and sphagnum moss for sale, or where an Interim Conservation Order has been made to protect critical habitat for a threatened species or community. As no such habitat has ever been declared, this mechanism under the FFG Act has never been implemented.

Implications under the FFG Act for the current proposal are discussed in Section 7.4.

3.5. EE Act

One or a combination of a number of criteria may trigger a requirement for a Referral to the Victorian Minister for Planning who will determine if an EES is required according to the “Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978*” (DSE 2006).

Implications under the EE Act for the current proposal are discussed in Section 7.5.

4. EXISTING INFORMATION & METHODS

4.1. Existing information

Existing information used for this investigation is described below.

4.1.1. Existing reporting and documentation

The reports, planning schemes and/or development plans below, relating to the study area were reviewed.

- South Gippsland Planning Scheme

4.1.2. Native vegetation

Pre-1750 (pre-European settlement) vegetation mapping administered by DELWP was reviewed to determine the type of native vegetation likely to occur in the study area and surrounds. Information on Ecological Vegetation Classes (EVCs) was obtained from published EVC benchmarks. These sources included:

- Relevant EVC benchmarks for the Gippsland Plain bioregion¹ (DSE 2004a); and
- NatureKit (DELWP 2017b).

4.1.3. Listed matters

Existing flora and fauna species records and information about the potential occurrence of listed matters was obtained from an area termed the ‘search region’, defined here as an area with a radius of ten kilometres from the approximate centre point of the study area (coordinates: latitude 38° 19’ 46” S and longitude 145° 40’ 56” E).

A list of the flora and fauna species recorded in the search region was obtained from the Victorian Biodiversity Atlas (VBA), a database administered by DELWP (2017c).

The online *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (DoEE 2017) was consulted to determine whether nationally listed species or communities potentially occurred in the search region based on habitat modelling.

4.2. Field methods

The flora and fauna assessment was undertaken on the 21st and 22nd August 2017 by Justin Sullivan (Senior Ecologist) at BL&A. A follow up flora survey was undertaken on 19th July 2018 to collect additional site-based information, as required by the Guidelines (DELWP 2017a), which came into effect in December 2017. During these assessments, the study area was surveyed on foot. Sites in the study area found to support native vegetation were mapped using a combination of aerial photograph interpretation and handheld GPS.

¹ A bioregion is defined as “a geographic region that captures the patterns of ecological characteristics in the landscape, providing a natural framework for recognising and responding to biodiversity values”. In general bioregions reflect underlying environmental features of the landscape (DNRE 1997).

4.2.1. Native vegetation

Native vegetation is currently defined in the Victoria Planning Provisions as ‘plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses’. The Guidelines (DELWP 2017a) further classify native vegetation as belonging to two categories:

- Patch; or
- Scattered tree.

The definitions of these categories are provided below, along with the prescribed DELWP methods to assess them. Further details on definitions of patches and scattered trees are provided in Appendix 1.

Patch

A patch of native vegetation is either:

- An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native; or
- Any area with three or more native canopy trees² where the drip line³ of each tree touches the drip line of at least one other tree, forming a continuous canopy; or
- Any mapped wetland included in the *Current wetlands map*, available in DELWP systems and tools.

Patch condition is assessed using the habitat hectare method (Parkes *et al.* 2003; DSE 2004b) whereby components of the patch (e.g. tree canopy, understorey and ground cover) are assessed against an EVC benchmark. The score effectively measures the percentage resemblance of the vegetation to its original condition.

The Native Vegetation Information Management (NVIM) system (DELWP 2017d) provides modelled condition scores for native vegetation to be used in certain circumstances.

Scattered tree

A scattered tree is:

- A native canopy tree² that does not form part of a patch.

Scattered trees are counted and mapped, the species identified and their circumference at 1.3 m above the ground is recorded.

4.2.2. Flora species and habitats

Records of flora species were made in conjunction with sampling methods used to undertake habitat hectare assessments of native vegetation described above. Specimens requiring identification using laboratory techniques were collected.

Species protected under the FFG Act were determined by crosschecking against the FFG Act Protected Flora List (DELWP 2017f).

² A native canopy tree is a mature tree (i.e. it is able to flower) that is greater than 3 metres in height and is normally found in the upper layer of the relevant vegetation type.

³ The drip line is the outermost boundary of a tree canopy (leaves and/or branches) where the water drips on to the ground.

The potential for habitats to support listed flora species was assessed based on the criteria outlined below:

- The presence of suitable habitat for flora species such as soil type, floristic associations and landscape context; and
- The level of disturbance of suitable habitats by anthropogenic disturbances and invasions by pest plants and animals.

Wherever appropriate, a precautionary approach was adopted in determining the likelihood of occurrence of flora listed under the EPBC Act and/or FFG Act. That is, where insufficient evidence was available on the potential occurrence of a listed species, it is assumed that it could be in an area of suitable habitat.

4.2.3. Targeted flora surveys

A targeted flora survey was undertaken on 19th July 2018 to determine the status of Green-striped Greenhood and Strzelecki Gum in parts of the study area that will likely be subject to impacts on native vegetation (as depicted in Figure 3 below).




The field method employed for the Green-striped Greenhood survey involved visually searching for the species along transects spaced no more than 5 metres apart in suitable habitat in the study area (Figure 3). Any Green-striped Greenhood observed during the survey were mapped using a handheld GPS. Timing of the survey was considered to be optimal, as Green-striped Greenhood is known to flower between July and September.

The field method employed for the Strzelecki Gum involved systematic identification of all gum-barked eucalypts in the survey area (Figure 3). Any Strzelecki Gum observed during the survey were mapped using a handheld GPS.




Figure 3: Targeted flora survey area

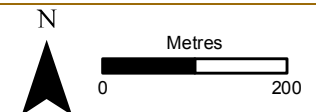
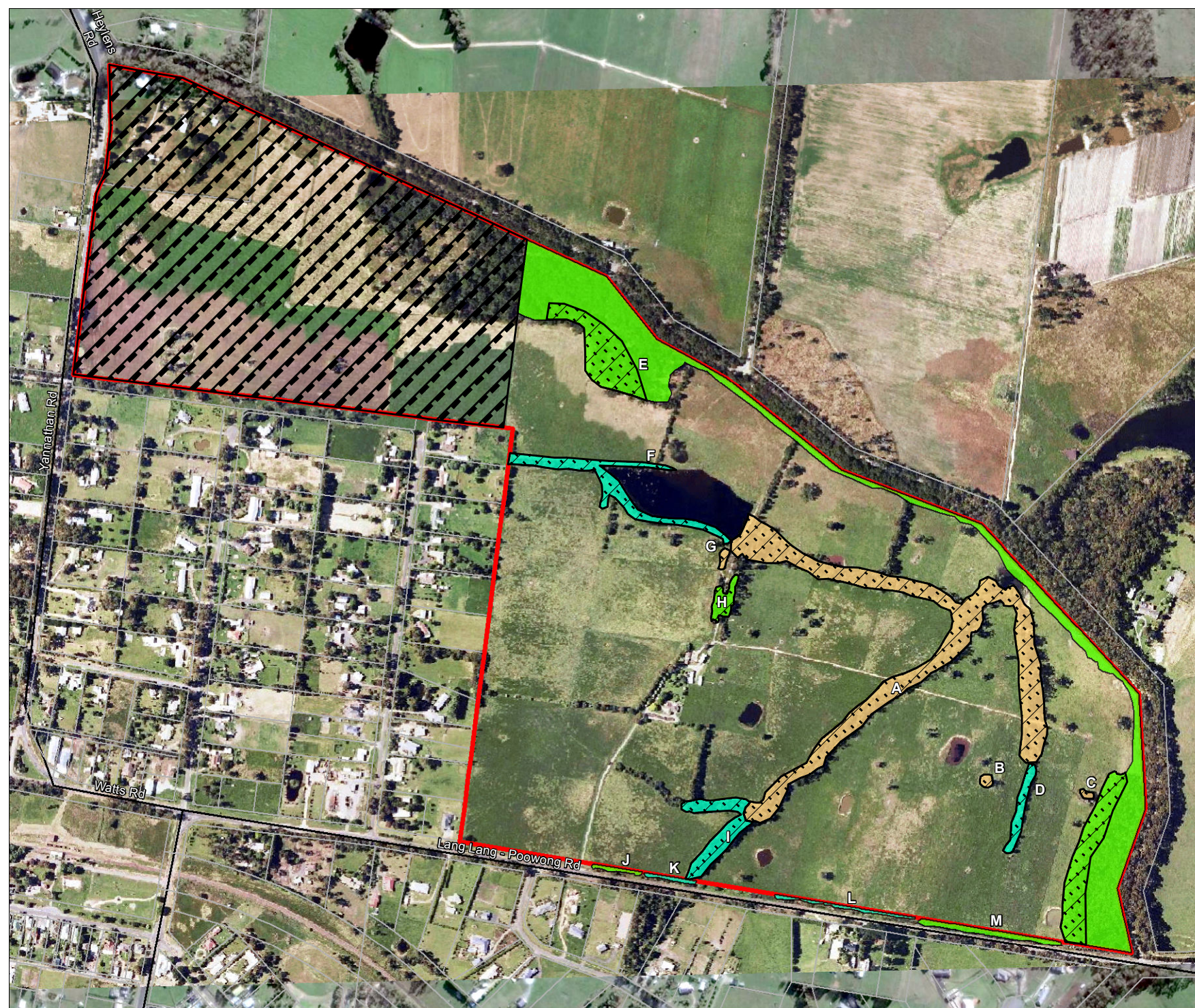
Project: NYORA-POOWONG RD, NYORA
Client: Beveridge Williams
Date: 27/09/2018

Legend

-  Study area
-  Targeted flora survey area
-  No access provided

Native vegetation

-  Lowland Forest (EVC 16)
-  Swamp Scrub (EVC 53)
-  Swampy Riparian Woodland (EVC 83)



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4.2.4. Fauna species and habitats

The techniques below were used to detect fauna species utilising the study area.

- Incidental searches for mammal scats, tracks and signs (e.g. diggings, signs of feeding and nests/burrows).
- Turning over logs/rocks and other ground debris for reptiles, frogs and mammals.
- Bird observation during the day.
- General searches for reptiles and frogs; including identification of frog calls in seasonally wet areas.

Fauna habitats are described using habitat components that include old-growth trees, fallen timber, leaf litter and surface rocks.

The study area's habitat connectivity (i.e. degree of isolation/fragmentation), including linkages to other habitats in the region, was determined using field observations, recent aerial photography and DELWP's NatureKit (DELWP 2017b).

Wherever appropriate, a precautionary approach was adopted in determining the likelihood of occurrence or fauna listed under the EPBC Act and FFG Act. That is, where insufficient evidence was available on the potential occurrence of a listed species, it is assumed that it could be in an area of suitable habitat.

4.2.5. Targeted surveys for Giant Gippsland Earthworm and Dwarf Galaxias

The following targeted surveys were undertaken by specialist consultants within accessible parts of the study area:

- Targeted survey for Dwarf Galaxias – undertaken by Aquatica Environmental on 29th and 30th August 2017 (Aquatica Environmental 2017; Appendix 8); and
- Targeted survey for Giant Gippsland Earthworm – undertaken by Invert-Eco on 21st August 2017 (Invert-Eco 2017; Appendix 9).

Details on the methods used during the above targeted surveys are provided in appendices 8 and 9.

4.2.6. Southern Brown bandicoot targeted survey

A targeted survey was undertaken for Southern Brown Bandicoot (listed as endangered under the EPBC Act and as threatened under the FFG Act) to determine its status in the study area, as this species was considered to potentially occur in the study area due to the presence of suitable habitat and there are numerous recent VBA records in the search region. The survey was undertaken in accordance with the Commonwealth Department of the Environment and Energy (DoEE) *EPBC Act draft referral guidelines for the endangered southern brown bandicoot (eastern), Isoodon obesulus obesulus* (DSEWPaC 2011). The survey was undertaken in two rounds between 3rd to 19th July 2018 and 20th August to 11th September 2018, within all areas of suitable habitat in the accessible part of the study area (i.e. all treed native vegetation within the property at 379 Lang Land-Poowong Road, Nyora).

A full account of the Southern Brown Bandicoot survey methods and limitations is provided in the stand-alone BL&A Report 17032 (4.0) (BL&A 2018a).

4.2.7. Threatened ecological communities

The study area was assessed against published descriptions of relevant listed Commonwealth and state ecological communities modelled to potentially occur in the study area.

4.2.8. Limitations of field assessments

At the time of the surveys, access was not granted to the two smaller lots in the western section of the study area (951 Yannathan Road and 30 Glovers Road). As such, information presented on this section of the study area is limited to desktop information and observations from adjacent properties and public vantage points.

The initial site assessment was carried out in late winter. The short duration and seasonal timing of field assessments can result in some species not being detected when they may occur at other times. Additionally, some flora species and life-forms may be undetectable at the time of the survey or unidentifiable due to a lack of flowers or fruit.

The timing of this survey and condition of vegetation was otherwise considered suitable to ascertain the extent and condition of native vegetation and fauna habitats.

5. ASSESSMENT RESULTS

5.1. Site description

The study area for this investigation (Figure 4) was approximately 103 hectares of private land located immediately to the north east of the existing Nyora township in South Gippsland, Victoria. The study area comprised three large farming lots, namely 951 Yannathan Road, 30 Glovers Road and 379 Lang Lang-Poowong Road. The study area was bounded by Lang Lang-Poowong Road to the south, Glovers Road to the north and north-east, and Yannathan Road to the west. Low density residential lots adjoined the study area to the south west.

The study area supported black sandy soils over a heavily sloping landscape. Habitat within the study area comprised open grazing paddocks with scattered paddock trees, aquatic habitats and areas of remnant treed vegetation. The study area lies within the Gippsland Plain bioregion and falls within the Port Phillip and Western Port CMA.

At the time of the survey, access was not granted to the two smaller lots in the western section of the study area (951 Yannathan Road and 30 Glovers Road). Detailed survey was hence limited to 379 Lang Lang-Poowong Road and detailed information on the occurrence, type and extent of native vegetation is limited to this area.

A general description of the vegetation and fauna habitat in the two smaller lots (951 Yannathan Road and 30 Glovers Road) is provided based on observations from the neighbouring property and adjacent public roads.

5.1.1. 379 Lang Lang-Poowong Road

An occupied dwelling and associated outbuildings occurred on the highest point of the largest lot in the study area, 379 Lang Lang-Poowong Road. The property comprised of open grassy paddocks with scattered paddock trees, as well as fenced off treed areas. The property exhibited a long history of grazing, with dairy cattle observed grazing the paddocks at the time of the survey. The open paddocks throughout the study area were comprised of introduced pasture grasses and broadleaf weeds, namely Cape Weed. The history of cattle grazing throughout the paddocks has resulted in the ground layer being heavily pugged, especially in the lower lying areas.

A main drainage line ran diagonally through the property, with an offshoot running into a large dam. Several dead trees (stags) occurred in the western end of this dam, while the southern and western boundaries were lined with dense stands of Swamp Paperbark. Several additional small dams occurred throughout the property, all of which lacked fringing vegetation.

Treed sections of the study area were well fenced (limiting grazing by cattle) and supported a range of vegetation types from Lowland Forest along the eastern and northern boundary of the study area to Swampy Riparian Woodland and Swamp Scrub along the drainage lines.

Various plantings were observed throughout the property. While some planted treelines were considered to be mainly for the purpose of windbreaks or aesthetic value, plantings along the main drainage lines comprised appropriate indigenous species and enhanced the understorey of otherwise remnant vegetation (remnant Swamp Gum and Swamp Paperbark along the drainage lines).

The results of the detailed assessment of native vegetation undertaken at 379 Lang Lang-Poowong Road is provided in Section 5.2.

5.1.2. 30 Glovers Road

No dwellings occurred on the property at 30 Glovers Road. The majority of the property was being grazed by cattle, largely comprising open paddocks dominated by introduced pasture. The treed area in the north-east section of the property was considered likely to comprise Lowland Forest (EVC 16), being contiguous with similar vegetation to the east at 379 Lang Lang-Poowong Road (HZ E). While the canopy was similar, the vegetation at 30 Glovers Road was considered likely to have a lower habitat score due to a much sparser understorey.

Several additional remnant canopy trees occurred in the paddocks, some of which occurred in clusters and would be considered as remnant patches, others which occur separately and would be considered as scattered trees.

5.1.3. 951 Yannathan Road

A dwelling and associated buildings occurred on the smallest property in the study area, 951 Yannathan Road. Vegetation at this property appeared to comprise of a mixture of planted garden species and remnant native vegetation.

5.1.4. Nearby important habitats

The following key habitat areas occurred within the broader region:

- Nyora Nature Conservation Reserve (2 kilometres east of the study area);
- Adams Creek Nature Conservation Reserve (within 5 kilometres west of the study area), which occurs within an area of approximately 800 hectares of adjoining densely forested vegetation (the nearest area of core habitat);
- The Gurdies Nature Conservation Reserve (11 kilometres to the south west of the study area); and
- Large areas of forested vegetation which occur between Adams Creek NCR and The Gurdies NCR.

Vegetation in the study area, (specifically the area of Lowland Forest that occurs along the northern and eastern boundaries of the site), forms part of a narrow linear corridor that links Nyora NCR with Adams Creek NCR.

5.2. Native vegetation

5.2.1. Remnant patches

Pre-European EVC mapping (DELWP 2017b) indicated that the study area and surrounds would have supported Lowland Forest (EVC 16), Herb-rich Foothill Forest (EVC 23), Swamp Scrub (EVC 53) and Swampy Riparian Woodland (EVC 83) prior to European settlement based on modelling of factors including rainfall, aspect, soils and remaining vegetation.

Evidence on site, including floristic composition and soil characteristics, suggested that the following vegetation types occurred at 379 Lang Lang-Poowong Road and the adjacent Lang Lang-Poowong Road reserve:

- Lowland Forest (EVC 16) – along the northern and eastern boundary, as well as along Lang Lang-Poowong Road;
- Swamp Scrub (EVC 53) – along drains, surrounding the large dam and along Lang Lang-Poowong Road; and
- Swampy Riparian Woodland (EVC 83) – mainly along the drainage lines that diagonally dissect the property.

13 remnant patches (referred to herein as habitat zones) comprising the abovementioned EVCs were identified (Table 1) and included a total of 80 large trees in patches. Assessment of remnant patches of native vegetation was not undertaken in the two smaller lots (951 Yannathan Road and 30 Glovers) due to lack of access at the time of the survey.

Representative photos from each EVC recorded at 379 Lang Lang-Poowong Road are provided in Appendix 6.

Table 1: Description of habitat zones in the study area

Habitat Zone	EVC	Description
A	Swampy Riparian Woodland (EVC 83)	Linear area of woodland that occurs along a natural drainage line. Distinguished by the presence of remnant Swamp Gums in the canopy, many of which were Large Old Trees (LOTs). The understorey component comprised a mixture of remnant ground flora (sedges and rushes) as well as appropriate planted tree and shrub species which enhanced the patch (Blackwood, Silver Wattle, Burgan etc).
B, C	Swampy Riparian Woodland (EVC 83)	Small areas of woodland, classified as remnant patches purely on the basis of the canopy of Swamp Gum. (HZ C comprises 1 LOT). Understorey predominantly comprises introduced grasses.
D, I	Swamp Scrub (EVC 53)	Linear areas of scrub comprised almost exclusively of Swamp Paperbark. Patches include planted non-indigenous eucalypts which are not considered as a component of the remnant patch.
E	Lowland Forest (EVC 16)	Extensive patch of forest dominated by Narrow-leaf Peppermint, though also including Messmate Stringybark and Rough-barked Manna-gum in the canopy. Mid layer comprises sparse layer of trees and shrubs. Ground layer is dense and comprises a high cover of Austral Bracken and Thatch Saw-Sedge. Several herbs were recorded including several orchids, namely Nodding Greenhood and helmet orchid (species unknown). Weed cover low to moderate comprising of mostly high threat species, namely Sweet Pittosporum and Red Ink-weed. Habitat Zone is contiguous with adjacent habitats along Glovers Road and beyond the study area.
F	Swamp Scrub (EVC 53)	Narrow band of Swamp Paperbark around the western and southern boundary of the large dam. Limited diversity and low to moderate weed cover including Blackberry.
G	Swampy Riparian Woodland (EVC 83)	Small area of woodland at the end of a farm laneway distinguished by the presence of a Swamp Gum canopy, including two LOTs. High weed cover of introduced grasses.
H	Lowland Forest (EVC 16)	Area of woodland either side of existing farm laneway, dominated by a healthy canopy of Messmate Stringybark, including 7 LOTs. Ground layer comprises high cover of Austral Bracken, and grassy weeds. Planted non-native trees also in this patch, namely Spotted Gums, which as they are not native to this part of Victoria, have not been considered as a component of the remnant patch.
J, M	Lowland Forest (EVC 16)	Linear narrow patches along the northern side of Lang Lang-Poowong Road distinguished by the presence of young canopy trees and a high cover of Austral Bracken.
K, L	Swamp Scrub (EVC 53)	Linear narrow patches along the northern side of Lang Lang-Poowong Road distinguished by a high cover of Swamp Paperbark.

The habitat hectare assessment results for these habitat zones are provided in Table 2. More detailed habitat scoring results are presented in Appendix 2.

Table 2: Summary of habitat hectare assessment results

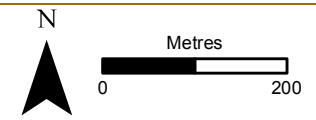
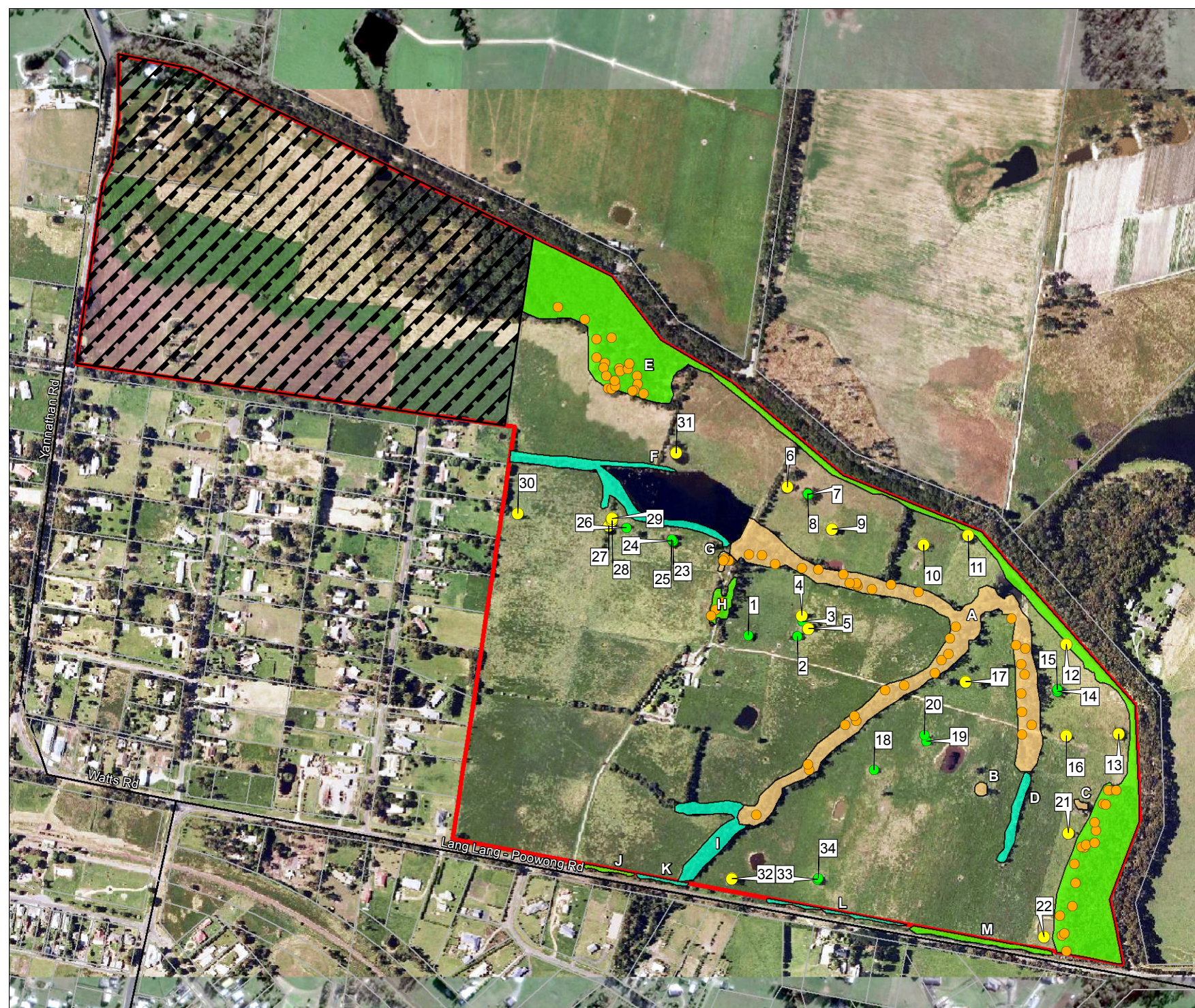
Habitat Zone	EVC no.	Area (ha)	Condition score (out of 100)	No. of Large Trees in HZ
A	83	3.438	50	35
B	83	0.036	22	0
C	83	0.023	24	0
D	53	0.209	35	NA
E	16	7.345	50	39
F	53	0.730	34	NA
G	83	0.038	30	3
H	16	0.165	37	3
I	53	0.487	35	NA
J	16	0.051	26	0
K	53	0.049	28	NA
L	53	0.108	28	NA
M	16	0.205	26	0
Total		12.884		80

Figure 4: Study area and native vegetation

Project: NYORA-POOWONG RD, NYORA
Client: Beveridge Williams
Date: 27/09/2018

Legend

- Study area
- No access provided
- Native vegetation**
- Lowland Forest (EVC 16)
- Swamp Scrub (EVC 53)
- Swampy Riparian Woodland (EVC 83)
- Large scattered trees
- Small scattered trees
- Large trees in patches



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5.2.2. Scattered trees

A total of 34 scattered trees occurred at 379 Lang Lang-Poowong Road, of which would have once comprised the canopy component of Lowland Forest (EVC 16) or Swampy Riparian Woodland (EVC 83). Details of the scattered trees recorded are listed in Appendix 3; size class of scattered trees is summarised in Table 3. All scattered Trees recorded are shown in Figure 4.

Assessment of scattered trees was not undertaken in the two smaller lots (951 Yannathan Road and 30 Glovers) due to lack of access at the time of the survey.

Table 3: Summary of scattered trees in the study area

Size Class	Representative EVC	DBH range (cm)	Number of trees
Large	Lowland Forest (16) / Swampy Riparian Woodland (EVC 83)	70 or more	18
Small		Less than 70	16
Total			34

NOTES on Scattered Trees:

*Size class has been determined based on the benchmark large tree diameter at breast height (DBH) for Lowland Forest (EVC 16) or Swampy Riparian Woodland (EVC 83) of 70 cm.

***Dead scattered trees were only considered if they were at least 40cm DBH.

5.3. Flora species

5.3.1. Flora species recorded

During the habitat hectare assessment at 379 Lang Lang-Poowong Road, 70 plant species were recorded. Of these, 39 (56%) were indigenous and 31 (44%) were introduced or non-indigenous native in origin (Appendix 4).

5.3.2. Listed flora species

VBA records (DELWP 2017c) and the EPBC Protected Matters Search Tool (DoEE 2017) indicated that within the search region there were records of, or there occurred potential suitable habitat for, nine flora species listed under the Commonwealth EPBC Act and nine flora species listed under the state *Flora and Fauna Guarantee Act 1988* (FFG Act), including eight listed under both Acts.

The likelihood of occurrence in the study area of species listed under the EPBC Act and FFG Act is addressed in Table 4. Species considered 'likely to occur' are those that have a very high chance of being in the study area based on numerous records in the search region and suitable habitat in the study area. Species considered to have the 'potential to occur' are those where suitable habitat exists, but recent records are scarce.

This analysis indicated that two listed flora species, Green-striped Greenhood and Strzelecki Gum, had the potential to occur in the study area, namely within the area of Lowland Forest that extends along the eastern and northern boundary of the study area (including Habitat Zone E).

Targeted flora surveys

Neither Green-striped Greenhood or Strzelecki Gum were detected during the targeted flora surveys in July 2018, within the survey area depicted in Figure 3. Therefore, both of these species are now considered unlikely to occur in those areas of native vegetation, but may occur outside of the Figure 3 survey area, which is unlikely to be impacted by the proposed development.

Table 4: FFG Act and EPBC Act listed flora species and likelihood of occurrence

Common Name	Scientific name	EPBC	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
Clover Glycine	<i>Glycine latrobeana</i>	VU	L	Found across south-eastern Australia in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer. In Victoria, populations occur in lowland grasslands, grassy woodlands and sometimes in grassy heath (DoEE 2017).	None	N/A	No suitable habitat present in study area and no records in search region - Unlikely to occur
Eastern Spider-orchid	<i>Caladenia orientalis</i>	EN	L	Heathland and Heathy Woodland in coastal areas between the Mornington Peninsula and Wilsons Promontory (Jeanes & Backhouse 2006).	None	N/A	No suitable habitat present in study area and no records in search region - Unlikely to occur
Green-striped Greenhood	<i>Pterostylis chlorogramma</i>	VU	L	Occurs in mixed Box-Stringybark forest with a shrubby understorey, often with <i>Pteridium esculentum</i> as a major component on sandy or clay loam soils (Duncan et al 2009).	4	8/07/2009	Recent records within search region, including one record from 1997 on Glovers Road, just to the north of the study area. Lowland Forest habitat recorded in the study area considered suitable with Bracken (<i>Pteridium esculentum</i>) a major component. However, not observed during the August vegetation assessment (within known flowering time for the species - July to Sep) or the July 2018 targeted survey (only in the survey area shown on Figure 3) Potential to occur within large area of Lowland Forest along northern and eastern boundary of study area (including Habitat Zone E), but now considered unlikely to occur in the survey area shown on Figure 3.
Leafy Greenhood	<i>Pterostylis cucullata</i>	VU	L	Tea-tree scrubs on tall sandy and calcareous dunes, in moist, open or even deep shaded locations (Jones 1994).	None	N/A	No suitable habitat present in study area and no records in search region - Unlikely to occur
Maroon Leek-orchid	<i>Prasophyllum frenchii</i>	EN	L	Grows mainly in open sedge swampland or in wet grassland and wet heathland generally bordering swampy regions. Sites are generally low altitude, flat and moist. Soils are generally moderately rich damp sandy or black clay loams. Climate is mild, with an annual rainfall of 600–1100 mm, occurring predominantly in winter and spring.	None	N/A	No suitable habitat present in study area and no records in search region - Unlikely to occur
Matted Flax-lily	<i>Dianella amoena</i>	EN	L	Lowland grassland and grassy woodlands on well-drained to seasonally waterlogged fertile sandy loams to heavy cracking soils derived from sedimentary or volcanic Geology. It is widely distributed from eastern to south-western Victoria (DoEE 2017).	None	N/A	No suitable habitat present in study area and no records in search region - Unlikely to occur

Common Name	Scientific name	EPBC	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
River Swamp Wallaby-grass	<i>Amphibromus fluitans</i>	VU		River Swamp Wallaby-grass grows mostly in permanent swamps and also lagoons, billabongs, dams and roadside ditches. The species requires moderately fertile soils with some bare ground; conditions that are caused by seasonally-fluctuating water levels (DoEE 2017).	None	N/A	No records in the search region. Dams in study area do not provide suitable habitat. Large dam in study area is altered (partially surrounded by pasture and partially surrounded by dense stand of Swamp Paperbark) and hence considered unlikely to support the species - Unlikely to occur
Small-leaf Wax-flower	<i>Philothea difformis subsp. difformis</i>		L	Apparently very rare in Victoria, recorded only from the north-west near Ouyen, the northern Grampians, and Bendigo area. In other States, occurring in sandy or rocky sites supporting mallee and dry woodland communities (Bayly 1999).	1	2/08/2000	Beyond known range for the species. No Wax-flower plants or similar were observed during the habitat hectare assessment. Unlikely to occur.
Strzelecki Gum	<i>Eucalyptus strzeleckii</i>	VU	L	Apparently endemic, confined to across the western section of the Strzelecki Range, from Neerim South in the north, south to Foster. Favours ridges, slopes and streambanks and deep fertile soils (Brooker & Slee 1996).	12	21/04/2011	Several records in the search region with records either side and in close range of Nyora. Lowland Forest in the study area was dominated by Narrow-leaf Peppermint, however at least two conspicuous tall forest gum trees were observed in this habitat, which are considered to potentially be Strzelecki Gum. Not recorded during the July 2018 targeted survey (only in the survey area shown on Figure 3). Potential to occur within large area of Lowland Forest along northern and eastern boundary of study area (including Habitat Zone E), but now considered unlikely to occur in the survey area shown on Figure 3
Swamp Everlasting	<i>Xerochrysum palustre</i>	VU	L	Grows in wetlands including sedge-swamps and shallow freshwater marshes, often on heavy black clay soils. Commonly associated genera include <i>Amphibromus</i> , <i>Baumea</i> , <i>Carex</i> , <i>Chorizandra</i> , <i>Craspedia</i> , <i>Eleocharis</i> , <i>Isolepis</i> , <i>Lachnagrostis</i> , <i>Lepidosperma</i> , <i>Myriophyllum</i> , <i>Phragmites australis</i> , <i>Themeda triandra</i> and <i>Villarsia</i> .	None	N/A	No records in the search region. Dams in study area do not provide suitable habitat. Large wetland in study area is altered and considered unlikely to support the species - Unlikely to occur

Notes: EPBC = threatened species status under EPBC Act: EX = presumed extinct in the wild; CR = critically endangered; EN = endangered; VU = vulnerable; FFG = threatened species status under the FFG Act: L = listed as threatened under the FFG Act.

5.4. Fauna habitats

The study area supported four main fauna habitat types.

- Native forest;
- Linear areas of mixed vegetation;
- Grazing paddocks with scattered trees; and
- Aquatic habitats.

Native Forest: Native forest habitat occurs along the eastern and northern boundary of the study area extending through all three lots. This habitat was dominated by Narrow-leaf Peppermint, though also included Messmate Stringybark and Rough-barked Manna-gum at lower cover levels. While some large trees were present, the proportion of large trees was very low. Understorey in this habitat type comprised a dense cover of Thatch Saw-sedge and Austral Bracken, which would provide good cover for small mammals. Many burrows and diggings were observed in the dark sandy soils of this habitat, with Eastern Grey Kangaroo and Black Wallaby both recorded and evidence of the presence of Common Wombat noted in this area. This habitat also had a high cover of fallen timber. This habitat type adjoins the same habitat along either side of Glovers Road which forms part of a narrow linear corridor that links Nyora NCR with Adams Creek NCR.

This habitat is considered high quality for native fauna.

Linear areas of mixed vegetation: This habitat type included linear stretches of vegetation. In the study area, the majority of this habitat type occurred along drainage lines and supported a remnant and planted canopy and a dense understorey comprising Swamp Paperbark, a healthy mixture of indigenous woody plantings, native sedges and ground cover weeds such as Buttercup and Blackberry. In the areas of this habitat type containing a remnant Swamp Gum canopy, there was a high proportion of large old trees, as well as a good amount of large fallen timber. A small amount of running water occurred along the main drainage lines through this habitat type. This habitat type provides habitat links to other treed habitats in the study area and beyond the site.

This habitat is considered low to moderate quality for native fauna.

Grazing paddocks with scattered trees: This habitat type occurred across the majority of the study area and comprised open farm paddocks which were being grazed by dairy cattle. The long history of agriculture in this area has resulted in the dominance of introduced pasture grasses throughout this habitat. A number of remnant scattered paddock trees exist throughout this area, most of which were Swamp Gums. Scattered paddock trees were generally in low health, with several being long dead. This habitat type is considered to provide foraging habitat for common farm birds. A small number of Eastern Grey Kangaroos (5 individuals) were recorded grazing in this habitat in the eastern portion of the study area.

This habitat is considered low quality for native fauna.

Aquatic habitats: Aquatic habitats in the study area comprised several dams, most of which that occurred in the eastern property, 379 Lang Lang-Poowong Road. Dams in the study area were artificial and mostly lacked fringing vegetation. One large dam in the centre of the study area was partly surrounded by a dense stand of Swamp Paperbark. Several large dead trees (stags) occurred in the western end of this dam. Several common birds were

recorded on this dam including several ducks, waterbirds and Cattle Egret. The large dam is connected to the vegetated drains in the study area.

This habitat is considered low to moderate quality for native fauna.

5.5. Fauna species

5.5.1. Species recorded

During the field assessment 50 fauna species were recorded. This included 42 bird (four introduced), five mammal (two introduced) and three frog species (Appendix 5).

5.5.2. Listed species

The review of existing information indicated that 41 fauna species listed under the state *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have previously been recorded within the search region or for which potential habitat occurs according to the EPBC Act Protected Matters Search Tool. The likelihood of occurrence of these species in the study area was assessed and the results are presented in Table 5.

Species considered ‘likely to occur’ are those that have a very high chance of being in the study area given the existence of numerous records in the search region and suitable habitat in the study area. Using the precautionary approach, species considered to have the ‘potential to occur’ are those where suitable habitat exists, but recent records are scarce. This analysis indicated that 12 listed fauna species were likely to occur or had the potential to occur in the study area. These species were:

- Barking Owl (threatened under FFG Act)
- Dwarf Galaxias (vulnerable under EPBC Act and threatened under FFG Act)
- Fork-tailed Swift (migratory under EPBC Act)
- Latham’s Snipe (migratory under EPBC Act)
- Powerful Owl (threatened under FFG Act)
- Rufous Fantail (migratory under EPBC Act)
- Satin Flycatcher (migratory under EPBC Act)
- White-throated Needletail (migratory under EPBC Act)
- Giant Gippsland Earthworm (vulnerable under EPBC Act and threatened under FFG Act)
- Greater Glider (vulnerable under EPBC Act and threatened under FFG Act)
- Southern Brown Bandicoot (endangered under EPBC Act & threatened under FFG Act)
- White-footed Dunnart (threatened under FFG Act)

Targeted surveys for Giant Gippsland Earthworm and Dwarf Galaxias

Targeted surveys were undertaken in August 2017 to determine the status of these species in the study area. The results of both targeted surveys were negative and both of these species are now considered unlikely to occur in the study area.

For a full account of the survey results, see appendices 8 and 9.

Southern Brown Bandicoot targeted survey

A targeted survey for Southern Brown Bandicoot was undertaken between August and September 2018. The results of the survey were negative, Southern Brown Bandicoot was not detected through the use of either camera traps or hair tubes and hair analysis over two separate survey periods over a month apart. It is therefore considered unlikely that Southern Brown Bandicoot is resident in the study area.

Unexpectedly, Swamp Antechinus (vulnerable under EPBC Act & threatened under FFG Act) was detected through hair analysis during the first round of the survey at one of the hair tube stations. This species was not initially considered to potentially occur in the study area, as the habitat there was considered marginal and there were no recent records of the species in the search region.

See Figure 5 for the location of the hair tube station where Swamp Antechinus was detected. The species was not detected again during the remainder of the targeted survey.

See the stand-alone BL&A Report 17032 (4.0) (BL&A 2018a) for a detailed account of the Southern Brown Bandicoot targeted survey.


Figure 5: Swamp Antechinus location in study area

Project: NYORA-POOWONG RD, NYORA

Client: Beveridge Williams

Date: 27/09/2018


Legend

 Study area

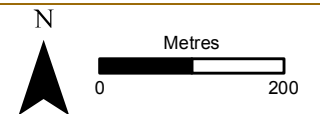
 Swamp Antechinus identified

Native vegetation

 Lowland Forest (EVC 16)

 Swamp Scrub (EVC 53)

 Swampy Riparian Woodland (EVC 83)



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Table 5: Listed fauna species from the search region and likelihood of occurrence in the study area

Common Name	Scientific name	EPBC-T	EPBC-M	FFG-T	Habitat	Number of records	Date of last record	Likelihood of occurrence
Birds								
Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN		L	Terrestrial wetlands, including a range of wetland types but prefers permanent water bodies with tall dense vegetation, particularly those dominated by sedges, rush, reeds or cutting grass (Marchant & Higgins 1990).	None	N/A	No records in search region. Aquatic habitat limited and unsuitable. Unlikely to occur.
Australian Painted Snipe	<i>Rostratula australis</i>	EN		L	Generally inhabits shallow terrestrial freshwater wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass or sometimes tea-tree (Melaleuca). Sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber (Department of the Environment 2016).	None	N/A	No records in search region. Aquatic habitat limited and unsuitable. Unlikely to occur.
Barking Owl	<i>Ninox connivens connivens</i>			L	Eucalyptus dominated forests and woodlands, commonly near water-bodies, such as streams and rivers, and requires hollow trees for nesting and trees with dense foliage for roosting (Higgins 1999).	1	1/01/1999	Forested habitat present. One record in search region. Potential to occur.
Black-faced Monarch	<i>Monarcha melanopsis</i>		M (Bonn (A2H))		Rainforests, eucalypt woodlands, coastal scrub and damp gullies (Higgins et al. 2006)	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Common Greenshank	<i>Tringa nebularia</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		Inhabits wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands (Higgins & Davies 1996).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Common Sandpiper	<i>Actitis hypoleucos</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		Inhabits a wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands. In Vic. Mostly found Westernport and Port Phillip Bay. (Higgins & Davies 1996).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Curlew Sandpiper	<i>Calidris ferruginea</i>	CR	M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		Inhabits wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands (Higgins & Davies 1996).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Eastern Curlew	<i>Numenius madagascariensis</i>	CR	M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		Inhabits sheltered coasts, especially estuaries, embayment, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats, often with beds of sea grass (Higgins & Davies 1996).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Eastern Great Egret	<i>Ardea modesta</i>			L	Occurs in a variety of wetlands including: permanent water bodies on flood plains; shallows of deep permanent lakes, either open or vegetated with shrubs or trees; semi-permanent swamps with tall emergent vegetation (e.g. bulrush) and herb dominated seasonal swamps with abundant aquatic flora (Marchant and Higgins 1990).	2	1/01/1981	No records in search region. Aquatic habitat limited and unsuitable. Unlikely to occur.

Common Name	Scientific name	EPBC-T	EPBC-M	FFG-T	Habitat	Number of records	Date of last record	Likelihood of occurrence
Fork-tailed Swift	<i>Apus pacificus</i>		M (JAMBA, CAMBA, ROKAMBA)		The species can occur in wet sclerophyll forest but mainly prefers open forest or plains. It is almost exclusively aerial and feeds up to hundreds of metres above the ground, but can feed among open forest canopy. The species breeds internationally and seldom roosts in trees and is unlikely to be impacted by the development (Higgins et al 2006b).	None	N/A	Forested habitat present. No records in search region. Potential to occur.
Glossy Ibis	<i>Plegadis falcinellus</i>		M (CAMBA, Bonn (A2S))		Prefer freshwater inland wetlands, in particular, permanent or ephemeral water bodies and swamps with abundant vegetation (Marchant & Higgins 1990).	2	1/04/1999	No records in search region. Aquatic habitat limited and unsuitable. Unlikely to occur.
Latham's Snipe	<i>Gallinago hardwickii</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		Occurs in wide variety of permanent and ephemeral wetlands; it prefers open freshwater wetlands with dense cover nearby, such as the edges of rivers and creeks, bogs, swamps, waterholes. The species is wide spread in southeast Australia and most of its population occurs in Vic. Except in the northwest of the state (Naarding 1983; Higgins and Davies 1996).	4	26/09/2008	Potential habitat exists in limited areas of aquatic habitat. Potential to occur.
Orange-bellied Parrot	<i>Neophema chrysogaster</i>	CE	M (JAMBA)	L	The Orange-bellied Parrot is endemic to south-eastern Australia. In Victoria, they mostly occur in sheltered coastal habitats, such as bays, lagoons and estuaries, or, rarely, saltworks. They are also found in low samphire herbland dominated by Beaded Glasswort (<i>Sarcocornia quinqueflora</i>), Sea Heath (<i>Frankenia pauciflora</i>) or Sea-blite (<i>Suaeda australis</i>), and in taller shrubland dominated by Shrubby Glasswort (<i>Sclerostegia arbuscula</i>) (Department of the Environment 2016).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Osprey	<i>Pandion cristatus</i>		M (Bonn (A2S))		Rare vagrant to Victoria (Marchant & Higgins 1993). Littoral and coastal habitats and terrestrial wetlands. They are mostly found in coastal areas but occasionally travel inland along major rivers (Johnstone & Storr 1998; Marchant & Higgins 1993; Olsen 1995). They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Painted Honeyeater	<i>Grantiella picta</i>	VU		L	Inhabits box-ironbark forests and woodlands and mainly feeds on the fruits of mistletoe. Strongly associated with mistletoe around the margins of open forests and woodlands. Occurs at few localities. Uncommon breeding migrant from further north, arriving in October and leaving in February. (Higgins et al. 2001; Tzaros 2005).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Pectoral Sandpiper	<i>Calidris melanotos</i>		M (JAMBA, ROKAMBA, Bonn (A2H))		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Powerful Owl	<i>Ninox strenua</i>			L	Open and tall wet sclerophyll forests with sheltered gullies and old growth forest with dense understorey. They are also found in dry forests with box and ironbark eucalypts and River Red Gum. Large old trees with hollows are required by this species for nesting. In Victoria, the Powerful Owl is widespread, having been recorded from most of the state. However, throughout its range it is uncommon and occurs in low densities. (Higgins 1999; Soderquist et al. 2002).	4	3/05/2005	Forested habitat Four records in the search region. Potential to occur.

Common Name	Scientific name	EPBC-T	EPBC-M	FFG-T	Habitat	Number of records	Date of last record	Likelihood of occurrence
Red Knot	<i>Calidris canutus</i>	EN	M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		In Australasia, the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They rarely use inland lakes or swamps (Higgins & Davies 1996).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Red-necked Stint	<i>Calidris ruficollis</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	4	29/11/1974	No suitable habitat. Lack of recent records in search region. Unlikely to occur.
Regent Honeyeater	<i>Anthochaera phrygia</i>	CR	M (JAMBA)	L	Inhabits dry box-ironbark eucalypt forests near rivers and creeks on inland slopes of the Great Dividing Range. It could also occur in small remnant patches or in mature trees in farmland or partly cleared agricultural land (Higgins et al. 2001).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Rufous Fantail	<i>Rhipidura rufifrons</i>		M (Bonn (A2H))		In east and south-east Australia, mainly inhabits tall wet sclerophyll forests, often in gullies. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, as well as parks and gardens (Higgins et al. 2006).	3	27/01/2011	Some suitable habitat recorded in study area. Recent record in search region. Potential to occur.
Satin Flycatcher	<i>Myiagra cyanoleuca</i>		M (Bonn (A2H))		Tall forests and woodlands in wetter habitats but not in rainforest (Higgins et al. 2006)	3	30/10/2007	Some suitable habitat recorded in study area. Recent record in search region. Potential to occur.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Swift Parrot	<i>Lathamus discolor</i>	CR		L	Prefers a narrow range of eucalypts in Victoria, including White Box, Red Ironbark and Yellow Gum as well as River Red Gum when this species supports abundant 'lerp'. Breeds in Tasmania and migrates to the mainland of Australia for the autumn, winter and early spring months. Lives mostly north of the Great Dividing Range, passing through Port Phillip district and Gippsland on migration (Emison et al. 1987; Higgins 1999; Kennedy and Tzaros 2005).	1	26/09/2008	Key feed tree species not recorded within the study area. Only one recent from the search region. Unlikely to occur.
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>			L	Maritime habitats, terrestrial large wetlands and coastal lands of tropical and temperate Australia and offshore islands, ranging far inland only over large rivers and wetlands. The eagles usually breed on coast and offshore islands and inland beside large lakes or rivers, usually in tall trees in or near water, also in cliffs, rock pinnacles and escarpments. (Marchant and Higgins 1993).	1	7/03/2009	Aquatic habitat on site not considered suitable to support the species. Only one record in the search region. Unlikely to occur
White-throated Needletail	<i>Hirundapus caudacutus</i>		M (JAMBA, CAMBA, ROKAMBA)		Aerial, over all habitats, but probably more over wooded areas, including open forest and rainforest. Often over heathland and less often above treeless areas such as grassland and swamps or farmland (Higgins 1999).	3	1/01/1981	Forested habitat present. Three old records in search region. Potential to occur.
Yellow Wagtail	<i>Motacilla flava</i>		M (JAMBA, CAMBA, ROKAMBA)		Extremely uncommon migrant. Few sightings in Victoria. Mostly occurs in well-watered open grasslands on the fringes of wetlands. Roosts in mangroves and other dense vegetation (DotE 2015).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.

Common Name	Scientific name	EPBC-T	EPBC-M	FFG-T	Habitat	Number of records	Date of last record	Likelihood of occurrence
Mammals								
Broad-toothed Rat	<i>Mastacomys fuscus mordicus</i>	VU		L	Alpine sedges and heaths, wet sedge and grass patches in forest in eastern highlands, south gippsland highland and Otways (Menkhorst 1995).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Greater Glider	<i>Petauroides volans</i>	VU		L	Forest habitats including peppermint, stringybark, ash and gum dominated (Menkhorst 1995).	None	N/A	Some suitable habitat recorded in study area. No records in search region. Potential to occur.
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	VU		L	Brisbane, Newcastle, Sydney and Melbourne are occupied continuously. Elsewhere, during spring, they are uncommon south of Nowra and widespread in other areas of their range. Roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. Roost vegetation includes rainforest patches, stands of Melaleuca, mangroves and riparian vegetation, but colonies also use highly modified vegetation in urban and suburban.	None	N/A	Suitable roosting habitat but beyond known occupied range. Unlikely to occur regularly.
Leadbeater's Possum	<i>Gymnobelideus leadbeateri</i>	CR		L	Ash forest with critical requirements of abundant nest sites in old hollow-bearing trees, a structurally dense canopy or secondary tree layer, an understorey containing Acacia spp. (Menkhorst 1995).	1	31/12/1900	No suitable habitat. No recent records in search region. Unlikely to occur.
Smoky Mouse	<i>Pseudomys fumeus</i>	EN		L	Occurs in a wide variety of habitats, from heath to dry sclerophyll forest, especially along ridgetops with a heath understorey, and occasionally adjacent wetter habitats such as fern gullies. A characteristic of many localities, except those in wet gullies, is a floristically diverse shrub layer with members of the plant families Epacridaceae, Fabaceae and Mimosaceae well represented (Department of the Environment 2016).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	EN		L	Species experts define suitable habitat for Southern Brown Bandicoots (eastern) to be any patches of native or exotic vegetation, within their distribution, which contains understorey vegetation structure with 50–80% average foliage density in the 0.2–1 m height range. In areas where native habitats have been degraded or diminished, exotic vegetation, such as Blackberry (<i>Rubus</i> spp.), can and often does, provide important habitat (Department of the Environment 2016).	32	27/05/2013	Suitable habitat present within the study area, although not recorded during targeted survey for the species in August–September 2018. Now considered unlikely to occur.
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	EN		L	Rainforest, wet and dry forest, coastal heath and scrub and River Red-gum woodlands along inland rivers (Menkhorst 1995).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.
Swamp Antechinus	<i>Antechinus minimus maritimus</i>	VU		L	Dense wet heath, tussock grassland, sedgeland heathy woodland and coastal heath and scrub (Menkhorst 1995).	1	23/10/1998	Habitat considered marginal for the species, although was detected in the study area during targeted survey for Southern Brown Bandicoot in August–September 2018. Occurs in study area.

Common Name	Scientific name	EPBC-T	EPBC-M	FFG-T	Habitat	Number of records	Date of last record	Likelihood of occurrence
White-footed Dunnart	<i>Sminthopsis leucopus</i>			L	Coastal tussock grassland and sedgeland, wet heath, and forest or woodland with a dense heathy understorey or mid-storey vegetation (Menkhorst 1995).	2	13/04/2012	Suitable habitat present within extensive area of Lowland Forest (EVC 16). Habitat in this area (HZ E) comprises dense ground cover of Austral Bracken and Thatch Saw-sedge which would provide suitable cover. Two recent records. Potential to occur in areas of Lowland Forest (HZ E).
Frogs								
Growling Grass Frog	<i>Litoria raniformis</i>	VU		L	Permanent, still or slow flowing water with fringing and emergent vegetation in streams, swamps, lagoons and artificial wetlands such as farm dams and abandoned quarries (Clemann & Gillespie 2004).	1	1/01/1981	Most dams in the study area lack fringing vegetation. The large dam in the centre of the site is altered (partially surrounded by pasture and partially surrounded by dense stand of Swamp Paperbark) and unsuitable. Other drainage lines in the study area comprise Swampy Riparian Woodland supporting remnant Swamp Gums and mixed understorey plantings. Aquatic habitats on site not considered suitable to support the species. Unlikely to occur.
Fish								
Australian Grayling	<i>Prototroctes maraena</i>	VU		L	Large and small coastal streams and rivers with cool, clear waters with a gravel substrate and altering pools and riffles (Cadwallader & Backhouse 1983).	2	12/02/1979	No suitable habitat. No recent records in search region. Unlikely to occur.
Dwarf Galaxias	<i>Galaxiella pusilla</i>	VU		L	Barwon River to Mitchell River. Vegetated margins of still water, ditches, swamps and backwaters of creeks, both ephemeral and permanent (Allen et al. 2002).	2	17/12/2008	The study area comprised a lack of nearby records, poor quality habitat for the species, inappropriate topography and limited fish passage (See detailed Dwarf Galaxias assessment report in Appendix 8). The targeted survey for Dwarf Galaxias undertaken by Aquatica Environmental in August 2017 did not record any Dwarf Galaxias. Highly unlikely to occur
Invertebrates								
Giant Gippsland Earthworm	<i>Megascolides australis</i>	VU		L	It is generally found in the deep blue-grey clay-like soils over cretaceous rocks in the western Strezlecki Ranges and in the alluvial soils in depositional zones to the north and south-west (Smith & Peterson 1982, Yen & Van Praagh 1993).	101	9/12/2014	Despite the prevalence of records within the search region, the study area does not support the appropriate clay based soils for the species, rather all soils found within the study area were found to be sand based (See detailed Giant Gippsland Earthworm assessment report in Appendix 9). The targeted survey for Giant Gippsland Earthworm undertaken by Invert-Eco in August 2017 did not record any Giant Gippsland Earthworm. Highly unlikely to occur

Common Name	Scientific name	EPBC-T	EPBC-M	FFG-T	Habitat	Number of records	Date of last record	Likelihood of occurrence
Golden Sun Moth	<i>Synemon plana</i>	CR		L	Areas that are, or have been native grasslands or grassy woodlands. It is known to inhabit degraded grasslands with introduced grasses being dominant, with a preference for the native wallaby grass being present (DEWHA 2009).	None	N/A	No suitable habitat. No records in search region. Unlikely to occur.

Notes: EPBC-T = threatened species status under EPBC Act; EX = presumed extinct in the wild; CR = critically endangered; EN = endangered; VU = vulnerable; EPBC-M = migratory status under the EPBC Act; M = listed migratory taxa; Bonn Convention (A2H) - Convention on the Conservation of Migratory Species of Wild Animals – listed as a member of a family; Bonn Convention (A2S) - Convention on the Conservation of Migratory Species of Wild Animals - species listed explicitly; CAMBA - China-Australia Migratory Birds Agreement; JAMBA - Japan-Australia Migratory Birds Agreement; ROKAMBA - Republic of Korea Australia Migratory Birds Agreement; FFG = threatened species status under the FFG Act; L = listed as threatened under the FFG Act.

5.5.3. Susceptibility of listed fauna to impacts

The following analysis identifies the susceptibility to development of listed fauna species which may utilise the study area. This analysis includes consideration of the factors below.

- The mobility of the species
- The availability and extent of other suitable habitat in the region and the degree to which each species may rely on habitat in the study area

Birds

Two listed non-migratory bird species are considered to have the potential to occur in the study area. The susceptibility of these species to possible impacts from any development in the study area is discussed below.

- **Barking Owl** (FFG Act: listed as threatened);
- **Powerful Owl** (FFG Act: listed as threatened)

Both these owl species have the potential to occur in the area of forested habitat along the eastern and northern boundary of the study area, as well as in the linear treed areas in the east of the site, both habitats which would provide suitable roosting habitat for these species. However, tree hollows were not observed in either habitat type. The forested habitat mostly comprised of younger Narrow-leaf Peppermint and had a very low proportion of large old trees. While some tree lines did have a higher proportion of large old trees, namely Swamp Gums, tree hollows were not readily observed in this habitat. As such, the study area was not considered to support suitable nesting/breeding habitat for the Barking Owl and Powerful Owl, which both nest in hollows.

There is the potential that these species may use the study area for roosting, though it is unlikely that the study area provides core breeding habitat for these species. As such, the development of the study area is unlikely to result in a significant impact on these species.

Migratory Birds

Five listed migratory bird species (excluding oceanic species and shorebirds) have the potential to occur in the study area. The susceptibility of these species to possible impacts from any development in the study area is discussed below.

- **Latham's Snipe** (EPBC Act: migratory)

Latham's Snipe is a commonly recorded migratory species, often recorded using narrow drainage lines in urban settings. This species may occasionally utilise the aquatic habitats in the study area. However, given the low quality of the aquatic habitats (dams and drains) at the site, it is considered unlikely that the development of the study area would impact directly on Latham's Snipe.

- **Rufous Fantail** (EPBC Act: migratory)
- **Satin Flycatcher** (EPBC Act: migratory)

Rufous Fantail and Satin Flycatcher both prefer tall forests, and occasionally utilise woodland habitats. While some forest habitat is present along the eastern and northern boundaries of the study area, the lowland forest habitat onsite is not the preferred habitat for these species (tall forest). Both species have limited (three) records in the search region. As such, it is considered unlikely that these species would

utilise the study area regularly, and as such would not be directly impacted by the proposed development.

- **Fork-tailed Swift** (EPBC Act: migratory)
- **White-throated Needletail** (EPBC Act: migratory)

Both the Fork-tailed Swift and White-throated Needletail are aerial species that occur in areas of treed vegetation like that recorded in the study area. While, these species may occasionally occur, due to their primarily aerial nature, it is unlikely that the proposed development of the study area would negatively impact these species.

Mammals

Three listed mammal species are considered to have the potential to occur in the study area. The susceptibility of these species to possible impacts from any development in the study area is discussed below.

- **Greater Glider** (EPBC Act: vulnerable; FFG Act: listed as threatened)

The Greater Glider is known to prefer tall forest habitats with eucalypts like that recorded within the eastern and northern boundaries of the study area. However, given the lack of hollows in the study area, and lack of records of Greater Glider in the search region it is considered that there is a low likelihood that this species would regularly utilise the study area. Therefore, impacts to this species from the proposed development are unlikely.

- **Swamp Antechinus** (EPBC Act: vulnerable; FFG Act: listed as threatened)

This species was unexpectedly detected in the study area through hair analysis at one of the hair tube stations during the first round of the survey. This species is known to inhabit dense wet heath, tussock grassland, sedgeland, heathy woodland and coastal heath and scrub, none of which occur in the study area or surrounds. So, it was initially deemed as unlikely to occur on the basis of no suitable habitat and no recent VBA records in the search region. The one VBA record in the 10-kilometre search region is from 1998, approximately nine kilometres west of the study area.

The closest known population is in the Gurdies Nature Conservation Reserve, some 12 kilometres south-west of the study area.

It is possible that Swamp Antechinus occurs in all large contiguous habitat zones in the study area, particularly habitat zones associated with the drainage system and Habitat Zone E. As all habitat zones associated with the drainage system are proposed to be removed, the development will have an impact on this species.

See the stand-alone BL&A Report 17032 (4.0) (BL&A 2018a) for a detailed account of the Southern Brown Bandicoot targeted survey.

- **White-footed Dunnart** (FFG Act: listed as threatened)

The White-footed Dunnart utilises coastal habitats as well as similar habitats to that discussed above for the Southern Brown Bandicoot. There are only two records of White-footed Dunnart in the search region. As such, the likelihood of occurrence is considered to be low and the study area is unlikely to support an important population of this species.

Other fauna

No other fauna, (namely no reptiles, frogs, fish or invertebrates), are considered to have the potential to occur in the study area.

5.6. Listed ecological communities

The EPBC Act Protected Matters Search Tool (DoEE 2017) indicated that one ecological community listed under the EPBC Act had the potential to occur in the study area (Table 6).

Table 6: EPBC Act listed ecological communities and likelihood of occurrence in the study area

Ecological Community	EPBC	Occurrence in the study area
Natural Damp Grassland of the Victorian Coastal Plains	CE	No areas of native grassland were recorded at 379 Lang Lang-Poowong Road. Based on the observations of the remaining two properties from adjoining areas, no areas of native grassland are considered to occur. Unlikely to occur in the study area.

Notes: EPBC = status under EPBC Act: CE = critically endangered.

Based on an assessment of native vegetation in the study area against published descriptions and condition thresholds, no listed ecological communities were considered to occur in the study area.

6. IMPACTS OF PROPOSED DEVELOPMENT

6.1. Proposed development

For this current proposal, impacts of the development are limited to the area of land within the 379 Lang Lang-Poowong Road property which is zoned General Residential Zone (GRZ), as well as the adjoining reserve of Lang Lang-Poowong Road. The bounds of the current proposal area are depicted on Figure 6.

The current proposal involves a large subdivision which would expand the residential centre of Nyora. The extent of the area of impact on native vegetation for the current proposal was considered to include the following:

- Direct native vegetation removal from the entirety of all habitat zones within the proposal area (including removal of all large trees within habitat zones), except for Habitat Zone E and native vegetation within the adjoining reserve of Lang Lang-Poowong Road (habitat zones J, K, L & M);
- Habitat Zone E: combination of direct native vegetation removal for the creation of building envelopes and fence lines and removal for the creation of defendable space, which equates to direct removal. All large trees within these impact areas will also be removed: and
- Removal of all scattered trees within the proposal area.

For details on the requirement to create defendable space in Habitat Zone E, see the Bushfire Management Statement for the project – BL&A Report 17032 (3.0) (BL&A 2018b).

6.2. Impacts of proposed development

Various design measures have been undertaken for this proposal to avoid and minimise impacts to native vegetation. These are detailed in Section 7.2.1.

6.2.1. Native vegetation

The current proposal will result in the loss of a total extent of 5.949 hectares of native vegetation as represented in Figure 6 and documented in the Native Vegetation Removal (NVR) report provided by DELWP (Appendix 10).

The native vegetation to be removed is in an area mapped as an endangered Ecological Vegetation Class.

Photographs of native vegetation proposed for removal are provided in Appendix 6.

6.2.2. Modelled species important habitat

The current proposal footprint will have a significant impact on habitat for the threatened species Gippsland Giant Earthworm *Megascolides australis*, as determined in Appendix 10.

6.2.3. Listed flora species

The analysis of the likelihood of occurrence of listed flora species presented in Section 5.3.2 identified that the following species could be impacted by any development in the study area:

- Green-striped Greenhood; and
- Strzelecki Gum.

However, targeted surveys for these two species were undertaken in July 2018, within the survey area depicted in Figure 3, and neither were detected. Therefore, both of these species are now considered unlikely to occur in those areas of native vegetation, but may occur outside of the Figure 3 survey area, which is unlikely to be impacted by the proposed development.

6.2.4. Listed fauna species

The analysis of susceptibility of listed fauna species to impacts presented in Section 5.5.3 identified that Swamp Antechinus will likely be impacted by the proposed development.

See the stand-alone BL&A Report 17032 (4.0) (BL&A 2018a) for a detailed account of the Southern Brown Bandicoot targeted survey.







6.2.5. Threatened ecological communities

The proposed development footprint will not result in any impacts on threatened ecological communities, as none occur in the study area or surrounds.




Figure 6: Study area and native vegetation to be removed

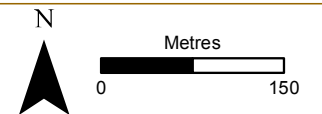
Project: NYORA-POOWONG RD, NYORA
Client: Beveridge Williams
Date: 9/10/2018

Legend

-  Study area
-  Native vegetation to be removed
-  Scattered and large trees to be removed
-  Large scattered trees
-  Small scattered trees
-  Large trees

Native vegetation (habitat zones)

-  Lowland Forest (EVC 16)
-  Swamp Scrub (EVC 53)
-  Swampy Riparian Woodland (EVC 83)



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7. IMPLICATIONS UNDER LEGISLATION AND POLICY

7.1. Summary of planning implications

A planning permit under Clause 52.17 of the South Gippsland Planning Scheme is required for the removal of native vegetation.

7.2. Implications under the Guidelines

7.2.1. Avoid and minimise statement

In accordance with the Guidelines, all applications to remove native vegetation must provide an avoid and minimise statement which details any efforts undertaken to avoid the removal of, and minimise the impacts on biodiversity and other values of native vegetation, and how these efforts focussed on areas of native vegetation that have the most value. Efforts to avoid and minimise impacts to native vegetation in the current application are presented as follows:

- Strategic level planning – The study area has not been subject to any regional or landscape scale strategic planning process that avoided and minimised impacts on native vegetation across a region or landscape.
- Site level planning – The development layout has been designed to minimise loss of native vegetation from Habitat Zone E, which was deemed to be the highest quality habitat in the study area.
- Furthermore, no feasible opportunities exist to further avoid and minimise impacts on native vegetation without undermining the key objectives of the proposal.

7.2.2. Assessment pathway

The assessment pathway is determined by the location category and the extent of native vegetation as detailed for the study area as follows:

- Location Category: Location 2; and
- Extent of native vegetation: A total of 5.949 ha of native vegetation (including 59 large trees).

Based on these details, the Guidelines stipulate that the proposal is to be assessed under the **Detailed** assessment pathway.

This proposal **would** trigger a referral to DELWP based on the criteria specified in Section 3.2.3.

7.2.3. Offset requirements

Offsets required to compensate for the proposed removal of native vegetation from the study area are provided below.

- 2.717 *general habitat units* and must include the following offset attribute requirements:
 - Minimum strategic biodiversity value (SBV) of 0.353;
 - Occur within the Port Phillip and Westernport CMA boundary or South Gippsland Shire municipal district; and
 - Include protection of at least 59 large trees.

Under the Guidelines all offsets must be secured prior to the removal of native vegetation.

7.2.4. Offset statement

It is recommended that the offset requirements for the current proposal be met via purchase of a third-party offset through DELWP's Native Vegetation Credit Register (NVCR).

DELWP accredited native vegetation brokers advise that the general offset units and large trees are readily available for trade through the NVCR.

7.3. EPBC Act

The EPBC Act protects a number of threatened species and ecological communities that are considered to be of national conservation significance. Any significant impacts on these species require the approval of the Australian Minister for the Environment.

If there is a possibility of a significant impact on nationally threatened species or communities or listed migratory species, a Referral under the EPBC Act should be considered. The Minister will decide after 20 business days whether the project will be a 'controlled action' under the EPBC Act, in which case it cannot be undertaken without the approval of the Minister. This approval depends on a further assessment and approval process (lasting between three and nine months, depending on the level of assessment).

It is possible that Swamp Antechinus occurs in all large contiguous habitat zones in the study area, particularly habitat zones associated with the drainage system and Habitat Zone E. As all habitat zones associated with the drainage system are proposed to be removed, the development will have an impact on this species.

Implications under the EPBC act for impacts on Swamp Antechinus as a result of the proposed development are currently being assessed in consultation with the proponent.

Significant impacts for all other species deemed to potentially occur in the study area are considered unlikely..

7.4. FFG Act

The Victorian FFG Act lists threatened and protected species and ecological communities (DELWP 2017c, DELWP 2017d). Any removal of threatened flora species or communities (or protected flora) listed under the FFG Act from public land requires a Protected Flora Permit under the Act, obtained from DELWP.

The FFG Act only applies to private land in relation to the commercial collection of grasstrees, tree-ferns and sphagnum moss.

The vast majority of land addressed in this assessment is private land, where the FFG Act does not apply in this instance. Public land in the study area comprised the adjoining reserve of Lang Lang-Poowong Road. No FFG Act listed values were recorded in the section of road reserve, therefore, a Protected Flora Licence or Permit under the FFG Act would not be required for the current proposal.

7.5. EE Act

The "Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978*" (DSE 2006), identifies criteria which trigger a Referral to the State Minister for Planning. The criteria related to flora, fauna and native vegetation are outlined below.

One or more of the following would trigger a Referral:

- Potential clearing of 10 ha or more of native vegetation from an area that:
 - Is of an Ecological Vegetation Class identified as endangered by the Department of Sustainability and Environment (in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework); or
 - Is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework); and
 - Is not authorised under an approved Forest Management Plan or Fire Protection Plan
- Potential long-term loss of a significant proportion (e.g. 1 to 5 percent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria
- Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'
- Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term

Two or more of the following would also trigger a Referral:

- Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan
- Matters listed under the Flora and Fauna Guarantee Act 1988:
 - Potential loss of a significant area of a listed ecological community; or
 - Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or
 - Potential loss of critical habitat; or
 - Potential significant effects on habitat values of a wetland supporting migratory bird species.

Based on these criteria, a Referral to the state Minister for Planning will not be required under the EE Act for the aspects covered by the current investigation.

7.6. CaLP Act

The *Catchment and Land Protection Act 1994* (CaLP Act) requires that land owners (or a third party to whom responsibilities have been legally transferred) must prevent the growth and spread of regionally controlled weeds.

In accordance with the *Catchment and Land Protection Act 1994*, the noxious weed species listed below, which were recorded in the study area, must be controlled.

- Blackberry; and
- Bulbil *Watsonia*.

Precision control methods that minimise off-target kills (e.g. spot spraying) should be used in environmentally sensitive areas (e.g. within or near native vegetation, waterways, etc.).

7.7. Mitigation recommendations

Recommendations to mitigate impacts on vegetation during construction are provided below:

- Establish appropriate vegetation protection zones around areas of native vegetation to be retained prior to works.
- Ensure all construction personnel are appropriately briefed prior to works, and that no construction personnel, machinery or equipment are placed inside vegetation/tree protection zones.
- Have a suitably qualified zoologist on site during any tree removal works to capture and relocate and misplaced fauna that may be present.

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Appendix 1: Details of the assessment process in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a)

Purpose and objective

Policies and strategies relating to the protection and management of native vegetation in Victoria are defined in the State Planning Policy Framework (SPPF). The objective identified in Clause 12.01 of all Victorian Planning Schemes is 'To ensure that there is no net loss to biodiversity as a result of the removal, destruction or lopping of native vegetation'.

This is to be achieved through the following three-step approach, as detailed in the Guidelines:

1. Avoid the removal, destruction or lopping of native vegetation.
2. Minimise impacts from the removal, destruction or lopping of native vegetation that cannot be avoided.
3. Provide an offset to compensate for the biodiversity impact from the removal, destruction or lopping of native vegetation.

Note: While a planning permit may still be required, if native vegetation does not meet the definition of either a patch or a scattered tree, an offset under the Guidelines is not required.

Assessment pathways

The first step in determining the type of assessment required for any site in Victoria is to determine the assessment pathway for the proposed native vegetation removal. The three possible assessment pathways for applications to remove native vegetation in Victoria are:

- Basic;
- Intermediate; or
- Detailed.

This assessment pathway is determined by two factors:

- **Location Category** – As determined using the states *Location Map*, the location category indicates the potential risk to biodiversity from removing a small amount of native vegetation. The three location categories are defined as:
 - Location 1 – shown in light blue on the *Location Map*, and occurring over most of Victoria.
 - Location 2 – shown in dark blue on the *Location Map*, and includes areas mapped as endangered EVCs and/or sensitive wetlands and coastal areas.
 - Location 3 – shown in orange on the *Location Map*, and includes areas where the removal of less than 0.5 ha of native vegetation could have a significant impact on habitat for rare and threatened species.
- **Extent of native vegetation** – The extent of any patches and scattered trees proposed to be removed (as well as the extent of any past native vegetation removal), with consideration as to whether the proposed removal includes any large trees. Extent of native vegetation is determined as follows:
 - Patch – The area of the patch in hectares

- Scattered Tree – The extent of a scattered tree is dependent on whether the scattered tree is small or large. A tree is considered to be a large tree if it is greater or equal to the large tree benchmark diameter at breast height (DBH) for the relevant bioregional EVC. Any scattered tree that is not a large tree is a small scattered tree. The extent of large and small scattered trees is determined as follows:
 - *Large scattered tree* – The area of a circle with a 15 metre radius, with the trunk of the tree at the centre.
 - *Small scattered tree* – The area of a circle with a 10 metre radius, with the trunk of the tree at the centre.

The assessment pathway for assessing an application to remove native vegetation is then determined as detailed in the following matrix table:

Extent of native vegetation	Location Category		
	Location 1	Location 2	Location 3
< 0.5 hectares and not including any large trees	Basic	Intermediate	Detailed
< 0.5 hectares and including one or more large trees	Intermediate	Intermediate	Detailed
≥ 0.5 hectares	Detailed	Detailed	Detailed

Note: If the native vegetation to be removed includes more than one location category, the higher location category is used to determine the assessment pathway.

Landscape scale information - Strategic biodiversity value

The strategic biodiversity value (SBV) is a measure of a location's importance to Victoria's biodiversity, relative to other locations across the state. It is represented as a score between 0 and 1 and determined from the *Strategic biodiversity value map*, available from NVIM.

Landscape scale information - Habitat for rare or threatened species

Habitat importance for rare or threatened species is a measure of the importance of a location in the landscape as habitat for a particular rare or threatened species, in relation to other habitat available for that species. It is represented as a score between 0 and 1 and is determined from the *Habitat importance maps*, administered by DELWP.

This includes two groups of habitat:

- *Highly localised habitats* – limited in area and considered to be equally important, therefore having the same habitat importance score.
- *Dispersed habitats* – less limited in are and based on habitat distribution models.

Habitat for rare or threatened species is used to determine the type of offset required in the detailed assessment pathway.

Biodiversity value

A combination of site-based and landscape scale information is used to calculate the biodiversity value of native vegetation to be removed. Biodiversity value is represented by a general or species habitat score, detailed as follows.

Firstly, the extent and condition of native vegetation to be removed are combined to determine the habitat hectares as follows:

$$\text{Habitat hectares} = \text{extent of native vegetation} \times \text{condition score}$$

Secondly, the habitat hectare score is combined with a landscape factor to obtain an overall measure of biodiversity value. Two landscape factors exist as follows:

- General landscape factor – determined using an adjusted strategic biodiversity score, and relevant when no habitat importance scores are applicable;
- Species landscape factor – determined using an adjusted habitat importance score for each rare or threatened species habitat mapped at a site in the *Habitat importance map*.

These factors are then used as follows to determine the biodiversity value of a site:

$$\text{General habitat score} = \text{habitat hectares} \times \text{general landscape factor}$$

$$\text{Species habitat score} = \text{habitat hectares} \times \text{species landscape factor}$$

Offset requirements

A native vegetation offset is required for the approved removal of native vegetation. Offsets conform to one of two types and each type incorporates a multiplier to address the risk of offset:

- A *General offset* is required when the removal of native vegetation does not have a significant impact on any habitat for rare or threatened species (i.e. the proportional impact is below the species offset threshold). In this case a multiplier of 1.5 applies to determine the general offset amount.

$$\text{General offset (amount of general habitat units)} = \text{general habitat score} \times 1.5$$

- A *Species offset* is required when the removal of native vegetation has a significant impact on habitat for a rare or threatened species (i.e. the proportional impact is above the species offset threshold). In this case a multiplier of 2 applies to determine the species offset amount.

$$\text{Species offset (amount of species habitat units)} = \text{Species habitat score} \times 2$$

Note: if native vegetation does not meet the definition of either a patch or scattered tree an offset is not required.

Offset attributes

Offsets must meet the following attribute requirements, as relevant:

- General offsets
 - *Offset amount:* General offset = general habitat score x 1.5
 - *Strategic biodiversity value (SBV):* The offset has at least 80% of the SBV of the native vegetation removed
 - *Vicinity:* The offset is in the same CMA boundary or municipal district as the native vegetation removed
 - *Habitat for rare and threatened species:* N/A
 - *Large trees:* The offset include the protection of at least one large tree for every large tree to be removed
- Species offsets
 - *Offset amount:* Species offset = species habitat score x 2
 - *Strategic biodiversity value (SBV):* N/A
 - *Vicinity:* N/A
 - *Habitat for rare and threatened species:* The offset comprises mapped habitat according to the *Habitat importance map* for the relevant species
 - *Large trees:* The offset include the protection of at least one large tree for every large tree to be removed

Appendix 2: Detailed habitat hectare assessment results

Habitat Zone		A	B	C	D	E	F	G	H	I	J	K	L	M		
Bioregion		GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP		
EVC Number		83	83	83	53	16	53	83	16	53	16	53	53	16		
Total area of Habitat Zone (ha)		3.438	0.036	0.023	0.209	7.345	0.730	0.038	0.165	0.487	0.051	0.049	0.108	0.205		
Site Condition	Large Old Trees	/10	9	0	9	N/A	2	N/A	9	9	N/A	0	N/A	N/A	0	
	Tree Canopy Cover	/5	4	4	4	4	4	5	4	4	3	2	2	2	2	
	Lack of Weeds	/15	6	4	4	6	7	9	4	6	6	6	4	4	6	
	Understorey	/25	15	5	5	5	15	5	5	5	5	10	5	5	10	
	Recruitment	/10	6	0	0	6	0	3	0	0	6	1	5	5	1	
	Organic Matter	/5	3	3	0	5	5	3	5	5	5	5	5	5	5	5
	Logs	/5	3	4	0	N/A	5	N/A	0	5	N/A	0	0	0	0	0
	Site condition standardising multiplier*		1.00	1.00	1.00	1.25	1.00	1.25	1.00	1.00	1.25	1.00	1.25	1.25	1.25	1.00
	Site Condition subtotal		46	20	22	33	38	31	27	34	31	24	26	26	24	
Landscape Context	Patch Size	/10	2	1	1	1	8	1	1	1	2	1	1	1	1	
	Neighbourhood	/10	1	0	0	0	3	1	1	1	1	0	0	0	0	
	Distance to Core	/5	1	1	1	1	1	1	1	1	1	1	1	1	1	
Total Condition Score		/100	50	22	24	35	50	34	30	37	35	26	28	28	26	
Condition score out of 1			0.50	0.22	0.24	0.35	0.50	0.34	0.30	0.37	0.35	0.26	0.28	0.28	0.26	

* Modified approach to habitat scoring - refer to Table 14 of DELWP's Vegetation Quality Assessment Manual (DSE, 2004)

Appendix 3: Scattered trees and Large Trees in Patches recorded in the study area

Scattered trees

Tree No.	Common name	Scientific Name	DBH (cm)	Size Class	Notes
1	Swamp Gum	<i>Eucalyptus ovata</i>	68	Small	
2	Swamp Gum	<i>Eucalyptus ovata</i>	67	Small	
3	Swamp Gum	<i>Eucalyptus ovata</i>	66	Small	Dead
4	Swamp Gum	<i>Eucalyptus ovata</i>	83	Large	
5	Swamp Gum	<i>Eucalyptus ovata</i>	82	Large	Three stemmed
6	Swamp Gum	<i>Eucalyptus ovata</i>	71	Large	
7	Swamp Gum	<i>Eucalyptus ovata</i>	54	Small	
8	Swamp Gum	<i>Eucalyptus ovata</i>	63	Small	
9	Swamp Gum	<i>Eucalyptus ovata</i>	102	Large	Potential scar tree
10	Swamp Gum	<i>Eucalyptus ovata</i>	106	Large	
11	Swamp Gum	<i>Eucalyptus ovata</i>	96	Large	
12	Messmate Stringybark	<i>Eucalyptus obliqua</i>	78	Large	Dead; two stemmed
13	Messmate Stringybark	<i>Eucalyptus obliqua</i>	123	Large	Dead
14	Swamp Gum	<i>Eucalyptus ovata</i>	59	Small	
15	Swamp Gum	<i>Eucalyptus ovata</i>	30	Small	
16	Swamp Gum	<i>Eucalyptus ovata</i>	72	Large	
17	Swamp Gum	<i>Eucalyptus ovata</i>	88	Large	
18	Swamp Gum	<i>Eucalyptus ovata</i>	68	Small	Rotting from inside
19	Swamp Gum	<i>Eucalyptus ovata</i>	51	Small	Dead
20	Swamp Gum	<i>Eucalyptus ovata</i>	61	Small	Dead
21	Swamp Gum	<i>Eucalyptus ovata</i>	105	Large	
22	Messmate Stringybark	<i>Eucalyptus obliqua</i>	76	Large	Dead
23	Swamp Gum	<i>Eucalyptus ovata</i>	53	Small	
24	Swamp Gum	<i>Eucalyptus ovata</i>	56	Small	Dead

Tree No.	Common name	Scientific Name	DBH (cm)	Size Class	Notes
25	Swamp Gum	<i>Eucalyptus ovata</i>	46	Small	
26	Swamp Gum	<i>Eucalyptus ovata</i>	50	Small	
27	Swamp Gum	<i>Eucalyptus ovata</i>	81	Large	
28	Swamp Gum	<i>Eucalyptus ovata</i>	82	Large	
29	Swamp Gum	<i>Eucalyptus ovata</i>	70	Large	Almost dead
30	Swamp Gum	<i>Eucalyptus ovata</i>	100	Large	Overhanging from adjacent property
31	Swamp Gum	<i>Eucalyptus ovata</i>	93	Large	
32	Swamp Gum	<i>Eucalyptus ovata</i>	87	Large	
33	Swamp Gum	<i>Eucalyptus ovata</i>	63	Small	
34	Swamp Gum	<i>Eucalyptus ovata</i>	45	Small	

DBH = Diameter at breast height (130 cm from the ground)

Large trees in patches

A total of 80 large trees were recorded in patches within parts of the study area that will likely be subject to impacts on native vegetation (as depicted in Figure 3). As DBH measurement details for each tree were not collected, impacts on any of these trees will be based on a maximum Tree Retention Zone (TRZ) radius (see below). Further large trees will occur in Habitat Zone E outside of the Figure 3 survey area, although these are unlikely to be impacted by the proposed development.

Impact criteria for all trees

DELWP guidelines (DSE 2010) provide definitions regarding tree losses. These are outlined below, and it is considered that they should be applied to scattered trees and edges of treed remnant patches when determining the proximity of development to retained native vegetation.

Any tree is deemed lost when:

- Earthworks encroach on more than 10% of its Tree Retention Zone (TRZ) during construction activities. Tree Retention Zones:
 - Are defined as the area from the respective tree within a radius of 12 times the DBH of the respective tree, including the area above and below ground, notwithstanding it can be a minimum of two metres and a maximum of 15 metres radius around the respective tree
 - Extend at least one metre outside the crown projection, if the tree is a Tree Fern (DSE 2010)

- Directional drilling within its TRZ occurs at less than 600 millimetres below the surface, or is not confirmed to be appropriate (including considerations concerning bore hole width) by a qualified arborist
- Lopping removes more than 1/3 of its crown

Appendix 4: Flora species recorded in the study area and listed species known (or with the potential) to occur in the search region

Origin	Common name	Scientific name	EPBC	FFG	CaLP Act	WONS	Recorded
*	Agapanthus	<i>Agapanthus praecox subsp. orientalis</i>					X
*	Annual Meadow-grass	<i>Poa annua</i>					X
	Austral Bracken	<i>Pteridium esculentum</i>					X
	Black Wattle	<i>Acacia mearnsii</i>					X
*	Blackberry	<i>Rubus fruticosus spp. agg.</i>			C	WONS	X
	Blackwood	<i>Acacia melanoxylon</i>					X
	Broom Spurge	<i>Amperea xiphoclada var. xiphoclada</i>					X
*	Brown-top Bent	<i>Agrostis capillaris</i>					X
*	Bulbil Watsonia	<i>Watsonia meriana var. bulbifera</i>			C		X
	Burgan	<i>Kunzea ericoides spp. agg.</i>					X
	Buttercup	<i>Ranunculus spp.</i>					X
*	Cape weed	<i>Arctotheca calendula</i>					X
*	Chickweed	<i>Stellaria media</i>					X
*	Cleavers	<i>Galium aparine</i>					X
*	Clover	<i>Trifolium spp.</i>					X
	Clover Glycine	<i>Glycine latrobeana</i>	VU	L			
*	Clustered Dock	<i>Rumex conglomeratus</i>					X
	Coast Manna-gum	<i>Eucalyptus viminalis subsp. pryoriana</i>					X
*	Cocksfoot	<i>Dactylis glomerata</i>					X
	Common Ground-fern	<i>Calochlaena dubia</i>					X
	Common Raspwort	<i>Gonocarpus tetragynus</i>					X
*	Cootamundra Wattle	<i>Acacia baileyana</i>					X
*	Couch	<i>Cynodon dactylon var. dactylon</i>					X

Origin	Common name	Scientific name	EPBC	FFG	CaLP Act	WONS	Recorded
*	Daffodil	<i>Narcissus pseudonarcissus</i>					X
	Drooping Mistletoe	<i>Amyema pendula</i>					X
	Eastern Spider-orchid	<i>Caladenia orientalis</i>	EN	L			
*	Flatweed	<i>Hypochaeris radicata</i>					X
	Forest Wire-grass	<i>Tetrarrhena juncea</i>					X
#	Giant Honey-myrtle	<i>Melaleuca armillaris subsp. armillaris</i>					X
	Grass Triggerplant	<i>Stylidium graminifolium s.l.</i>					X
	Green-striped Greenhood	<i>Pterostylis chlorogramma</i>	VU	L			
*	Grey Sallow	<i>Salix cinerea</i>			P	WONS	X
	Groundsel	<i>Senecio spp.</i>					X
	Guinea Flower	<i>Hibbertia spp.</i>					X
	Helmet Orchid	<i>Corybas spp.</i>					X
	Hop Goodenia	<i>Goodenia ovata</i>					X
	Kangaroo Apple	<i>Solanum aviculare</i>					X
*	Kikuyu	<i>Cenchrus clandestinus</i>					X
	Leafy Greenhood	<i>Pterostylis cucullata</i>	VU	L			
	Maroon Leek-orchid	<i>Prasophyllum frenchii</i>	EN	L			
	Matted Flax-lily	<i>Dianella amoena</i>	EN	L			
*	Medic	<i>Medicago spp.</i>					X
	Messmate Stringybark	<i>Eucalyptus obliqua</i>					X
*	Mirror Bush	<i>Coprosma repens</i>					X
	Narrow-leaf Cumbungi	<i>Typha domingensis</i>					X
	Narrow-leaf Peppermint	<i>Eucalyptus radiata subsp. radiata</i>					X
	Narrow-leaf Wattle	<i>Acacia mucronata subsp. longifolia</i>					X
	Nodding Greenhood	<i>Pterostylis nutans</i>					X

Origin	Common name	Scientific name	EPBC	FFG	CaLP Act	WONS	Recorded
#	Ovens Wattle	<i>Acacia pravissima</i>					X
*	Panic Veldt-grass	<i>Ehrharta erecta var. erecta</i>					X
*	Perennial Rye-grass	<i>Lolium perenne</i>					X
	Pink-bells	<i>Tetralochea ciliata</i>					X
*	Prairie Grass	<i>Bromus catharticus</i>					X
	Prickly Moses	<i>Acacia verticillata</i>					X
	Prickly Tea-tree	<i>Leptospermum continentale</i>					X
	Red-fruit Saw-sedge	<i>Gahnia sieberiana</i>					X
*	Red-ink Weed	<i>Phytolacca octandra</i>					X
	River Swamp Wallaby-grass	<i>Amphibromus fluitans</i>	VU				
	Rough Tree-fern	<i>Cyathea australis</i>					X
	Rush	<i>Juncus spp.</i>					X
#	Sallow Wattle	<i>Acacia longifolia subsp. longifolia</i>					X
	Scented Paperbark	<i>Melaleuca squarrosa</i>					X
*	Sheep Sorrel	<i>Acetosella vulgaris</i>					X
	Silver Wattle	<i>Acacia dealbata</i>					X
	Small Grass-tree	<i>Xanthorrhoea minor subsp. lutea</i>					X
	Small-leaf Wax-flower	<i>Philothea difformis subsp. difformis</i>		L			
	Snowy Daisy-bush	<i>Olearia lirata</i>					X
	Spiny-headed Mat-rush	<i>Lomandra longifolia</i>					X
#	Spotted Gum	<i>Corymbia maculata</i>					X
	Strzelecki Gum	<i>Eucalyptus strzeleckii</i>	VU	L			
	Swamp Everlasting	<i>Xerochrysum palustre</i>	VU	L			
	Swamp Gum	<i>Eucalyptus ovata</i>					X
#	Swamp Paperbark	<i>Melaleuca ericifolia</i>					X

Origin	Common name	Scientific name	EPBC	FFG	CaLP Act	WONS	Recorded
	Sweet Bursaria	<i>Bursaria spinosa</i>					X
#	Sweet Pittosporum	<i>Pittosporum undulatum</i>					X
	Tall Sedge	<i>Carex appressa</i>					X
	Tasman Flax-lily	<i>Dianella tasmanica</i>					X
	Thatch Saw-sedge	<i>Gahnia radula</i>					X
*	White Arum-lily	<i>Zantedeschia aethiopica</i>					X

Notes: EPBC = threatened species status under EPBC Act: EX = presumed extinct in the wild; CR = critically endangered; EN = endangered; VU = vulnerable; FFG-T = threatened species status under the FFG Act: L = listed as threatened under the FFG Act; **CaLP Act** = declared noxious weeds status under the CaLP Act; C = Regionally Controlled Weeds (Land owners have the responsibility to take all reasonable steps to prevent the growth and spread of Regionally controlled weeds on their land); **WONS** = Weeds of National Significance; **X** = recorded in the study area; * = introduced to Victoria; # = Victorian native taxa occurring outside their natural range

Appendix 5: Terrestrial vertebrate fauna species recorded and listed species that have the potential to occur in the study area

Origin	Common name	Scientific name	EPBC-T	EPBC-M	FFG-T	Recorded
Birds						
	Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN		L	
	Australasian Grebe	<i>Tachybaptus novaehollandiae</i>				X
	Australian Magpie	<i>Gymnorhina tibicen</i>				X
	Australian Painted Snipe	<i>Rostratula australis</i>	EN		L	
	Australian Raven	<i>Corvus coronoides</i>				X
	Australian Shelduck	<i>Tadorna tadornoides</i>				X
	Australian White Ibis	<i>Threskiornis molucca</i>				X
	Australian Wood Duck	<i>Chenonetta jubata</i>				X
	Barking Owl	<i>Ninox connivens connivens</i>			L	
	Black-faced Monarch	<i>Monarcha melanopsis</i>		M (Bonn (A2H))		
	Brown Goshawk	<i>Accipiter fasciatus</i>				X
	Brown Thornbill	<i>Acanthiza pusilla</i>				X
	Cattle Egret	<i>Ardea ibis</i>				X
	Chestnut Teal	<i>Anas castanea</i>				X
*	Common Blackbird	<i>Turdus merula</i>				X
	Common Greenshank	<i>Tringa nebularia</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		
*	Common Myna	<i>Acridotheres tristis</i>				X
	Common Sandpiper	<i>Actitis hypoleucos</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		
*	Common Starling	<i>Sturnus vulgaris</i>				X
	Crimson Rosella	<i>Platycercus elegans</i>				X
	Curlew Sandpiper	<i>Calidris ferruginea</i>	CR	M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		

Origin	Common name	Scientific name	EPBC-T	EPBC-M	FFG-T	Recorded
	Eastern Curlew	<i>Numenius madagascariensis</i>	CR	M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		
	Eastern Great Egret	<i>Ardea modesta</i>			L	
	Eastern Rosella	<i>Platycercus eximius</i>				X
	Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>				X
	Eurasian Coot	<i>Fulica atra</i>				X
	Flame Robin	<i>Petroica phoenicea</i>				X
	Fork-tailed Swift	<i>Apus pacificus</i>		M (JAMBA, CAMBA, ROKAMBA)		
	Galah	<i>Eolophus roseicapilla</i>				X
	Glossy Ibis	<i>Plegadis falcinellus</i>		M (CAMBA, Bonn (A2S))		
	Grey Butcherbird	<i>Cracticus torquatus</i>				X
	Grey Fantail	<i>Rhipidura albiscarpa</i>				X
	Grey Shrike-thrush	<i>Colluricincla harmonica</i>				X
	Grey Teal	<i>Anas gracilis</i>				X
	Latham's Snipe	<i>Gallinago hardwickii</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		
	Laughing Kookaburra	<i>Dacelo novaeguineae</i>				X
	Little Raven	<i>Corvus mellori</i>				X
	Magpie-lark	<i>Grallina cyanoleuca</i>				X
	Masked Lapwing	<i>Vanellus miles</i>				X
	Noisy Miner	<i>Manorina melanocephala</i>				X
	Orange-bellied Parrot	<i>Neophema chrysoaster</i>	CE	M (JAMBA)	L	
	Osprey	<i>Pandion cristatus</i>		M (Bonn (A2S))		
	Pacific Black Duck	<i>Anas superciliosa</i>				X
	Painted Honeyeater	<i>Grantiella picta</i>	VU		L	

Origin	Common name	Scientific name	EPBC-T	EPBC-M	FFG-T	Recorded
	Pectoral Sandpiper	<i>Calidris melanotos</i>		M (JAMBA, ROKAMBA, Bonn (A2H))		
	Powerful Owl	<i>Ninox strenua</i>			L	
	Purple Swamphen	<i>Porphyrio porphyrio</i>				X
	Rainbow Lorikeet	<i>Trichoglossus haematodus</i>				X
	Red Knot	<i>Calidris canutus</i>	EN	M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		
	Red Wattlebird	<i>Anthochaera carunculata</i>				X
	Red-necked Stint	<i>Calidris ruficollis</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		
	Regent Honeyeater	<i>Anthochaera phrygia</i>	CR	M (JAMBA)	L	
	Rufous Fantail	<i>Rhipidura rufifrons</i>		M (Bonn (A2H))		
	Satin Flycatcher	<i>Myiagra cyanoleuca</i>		M (Bonn (A2H))		
	Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		M (JAMBA, CAMBA, ROKAMBA, Bonn (A2H))		
*	Spotted Turtle-Dove	<i>Streptopelia chinensis</i>				X
	Straw-necked Ibis	<i>Threskiornis spinicollis</i>				X
	Striated Thornbill	<i>Acanthiza lineata</i>				X
	Superb Fairy-wren	<i>Malurus cyaneus</i>				X
	Swift Parrot	<i>Lathamus discolor</i>	CR		L	
	Welcome Swallow	<i>Petrochelidon neoxena</i>				X
	White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>			L	
	White-browed Scrubwren	<i>Sericornis frontalis</i>				X
	White-eared Honeyeater	<i>Lichenostomus leucotis</i>				X
	White-faced Heron	<i>Egretta novaehollandiae</i>				X
	White-throated Needletail	<i>Hirundapus caudacutus</i>		M (JAMBA, CAMBA, ROKAMBA)		

Origin	Common name	Scientific name	EPBC-T	EPBC-M	FFG-T	Recorded
	White-throated Treecreeper	<i>Cormobates leucophaeus</i>				X
	Willie Wagtail	<i>Rhipidura leucophrys</i>				X
	Yellow Wagtail	<i>Motacilla flava</i>		M (JAMBA, CAMBA, ROKAMBA)		
Mammals						
	Black Wallaby	<i>Wallabia bicolor</i>				X
	Broad-toothed Rat	<i>Mastacomys fuscus mordicus</i>	VU		L	
	Common Wombat	<i>Vombatus ursinus</i>				X
	Eastern Grey Kangaroo	<i>Macropus giganteus</i>				X
*	European Rabbit	<i>Oryctolagus cuniculus</i>				X
	Greater Glider	<i>Petauroides volans</i>	VU		L	
	Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	VU		L	
	Leadbeater's Possum	<i>Gymnobelideus leadbeateri</i>	CR		L	
*	Red Fox	<i>Vulpes vulpes</i>				X
	Smoky Mouse	<i>Pseudomys fumeus</i>	EN		L	
	Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	EN		L	
	Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	EN		L	
	Swamp Antechinus	<i>Antechinus minimus maritimus</i>	VU		L	
	White-footed Dunnart	<i>Sminthopsis leucopus</i>			L	
Frogs						
	Common Froglet	<i>Crinia signifera</i>				X
	Growling Grass Frog	<i>Litoria raniformis</i>	VU		L	
	Southern Brown Tree Frog	<i>Litoria ewingii</i>				X
	Striped Marsh Frog	<i>Limnodynastes peronii</i>				X
Fish						
	Australian Grayling	<i>Prototroctes maraena</i>	VU		L	

Origin	Common name	Scientific name	EPBC-T	EPBC-M	FFG-T	Recorded
	Dwarf Galaxias	<i>Galaxiella pusilla</i>	VU		L	
Invertebrates						
	Giant Gippsland Earthworm	<i>Megascolides australis</i>	VU		L	
	Golden Sun Moth	<i>Synemon plana</i>	CR		L	

Notes: EPBC-T = threatened species status under EPBC Act; EX = presumed extinct in the wild; CE = critically endangered; EN = endangered; VU = vulnerable; EPBC-M = migratory status under the EPBC Act; M = listed migratory taxa; Bonn Convention (A2H) - Convention on the Conservation of Migratory Species of Wild Animals – listed as a member of a family; Bonn Convention (A2S) - Convention on the Conservation of Migratory Species of Wild Animals - species listed explicitly; CAMBA - China-Australia Migratory Birds Agreement; JAMBA - Japan-Australia Migratory Birds Agreement; ROKAMBA - Republic of Korea Australia Migratory Birds Agreement; FFG = threatened species status under the FFG Act; L = listed as threatened under the FFG Act.

Appendix 6: Photographs of native vegetation/habitat in the study area



Paddock trees (Swamp Gums) forming a remnant patch of Swampy Riparian Woodland (Habitat Zone C)



Scattered Tree (Swamp Gum)



Dead Scattered Tree (Messmate Stringybark)



Aquatic habitat (dam)



Lowland Forest (EVC 16) with young Narrow-leaf Peppermint canopy and dense Austral Bracken and Thatch Saw-sedge understorey (Habitat Zone E)



Swampy Riparian Woodland (EVC 83) with Swamp Gum canopy along drainage line (Habitat Zone A)



Swamp Scrub (EVC 53) showing a dense stand of Swamp Paperbark along drainage line (Habitat Zone I)

Appendix 7: EVC benchmarks

Gippsland Plain:

- Lowland Forest (EVC 16)
- Swamp Scrub (EVC 53)
- Swampy Riparian Woodland (EVC 83)

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 16: Lowland Forest

Description:

Eucalypt forest to 20 m tall on relatively fertile, moderately well-drained soils in areas of relatively high rainfall. Characterised by the diversity of life forms and species in the understorey including a range of shrubs, grasses and herbs.

Large trees:

Species	DBH(cm)	# / ha
<i>Eucalyptus</i> spp.	70 cm	20 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
30%	<i>Eucalyptus obliqua</i>	Messmate Stringybark
	<i>Eucalyptus radiata s.l.</i>	Narrow-leaf Peppermint
	<i>Eucalyptus consideriana</i>	Yertchuk

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Understorey Tree or Large Shrub	2	10%	T
Medium Shrub	7	30%	MS
Small Shrub	5	10%	SS
Prostrate Shrub	2	5%	PS
Large Herb	1	1%	LH
Medium Herb	7	10%	MH
Small or Prostrate Herb	7	5%	SH
Large Tufted Graminoid	2	15%	LTG
Large Non-tufted Graminoid	1	5%	LNG
Medium to Small Tufted Graminoid	7	15%	MTG
Medium to Tiny Non-tufted Graminoid	1	1%	MNG
Ground Fern	2	15%	GF
Scrambler or Climber	3	1%	SC
Bryophytes/Lichens	na	10%	BL

LF Code	Species typical of at least part of EVC range	Common Name
T	<i>Acacia melanoxylon</i>	Blackwood
MS	<i>Epacris impressa</i>	Common Heath
MS	<i>Leptospermum continentale</i>	Prickly Tea-tree
MS	<i>Banksia marginata</i>	Silver Banksia
MS	<i>Leptospermum myrsinoides</i>	Heath Tea-tree
SS	<i>Amperea xiphoclada var. xiphoclada</i>	Broom Spurge
PS	<i>Acrotriche serrulata</i>	Honey-pots
MH	<i>Gonocarpus tetragynus</i>	Common Raspwort
MH	<i>Drosera peltata ssp. auriculata</i>	Tall Sundew
MH	<i>Viola hederacea sensu Willis (1972)</i>	Ivy-leaf Violet
SH	<i>Opercularia varia</i>	Variable Stinkweed
LTG	<i>Xanthorrhoea minor ssp. lutea</i>	Small Grass-tree
LTG	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
LNG	<i>Gahnia radula</i>	Thatch Saw-sedge
MTG	<i>Lomandra filiformis</i>	Wattle Mat-rush
MTG	<i>Poa australis ssp. agg.</i>	Tussock Grass
MNG	<i>Microlaena stipoides var. stipoides</i>	Weeping Grass
GF	<i>Pteridium esculentum</i>	Austral Bracken
SC	<i>Billardiera scandens</i>	Common Apple-berry

EVC 16: Lowland Forest - Gippsland Plain bioregion

Recruitment:

Continuous

Organic Litter:

40 % cover

Logs:

20 m/0.1 ha.

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
MH	<i>Hypchoeris radicata</i>	Cat's Ear	high	low

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EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 53: Swamp Scrub

Description:

Closed scrub to 8 m tall at low elevations on alluvial deposits along streams or on poorly drained sites with higher nutrient availability. The EVC is dominated by Swamp Paperbark *Melaleuca ericifolia* (or sometimes Woolly Tea-tree *Leptospermum lanigerum*) which often forms a dense thicket, out-competing other species. Occasional emergent eucalypts may be present. Where light penetrates to ground level, a moss/lichen/liverwort or herbaceous ground cover is often present. Dry variants have a grassy/herbaceous ground layer.

Canopy Cover:

%cover	Character Species	Common Name
50%	<i>Leptospermum lanigerum</i> <i>Melaleuca ericifolia</i>	Woolly Tea-tree Swamp Paperbark

Understorey:

Life form	#Spp	%Cover	LF code
Medium Shrub	2	10%	MS
Small Shrub	2	1%	SS
Large Herb	2	5%	LH
Medium Herb	3	15%	MH
Small or Prostrate Herb	2	5%	SH
Large Tufted Graminoid	2	10%	LTG
Large Non-tufted Graminoid	3	10%	LNG
Medium to Small Tufted Graminoid	2	5%	MTG
Medium to Tiny Non-tufted Graminoid	2	15%	MNG
Ground Fern	1	5%	GF
Scrambler or Climber	1	1%	SC
Bryophytes/Lichens	na	20%	BL

LF Code	Species typical of at least part of EVC range	Common Name
MS	<i>Coprosma quadrifida</i>	Prickly Currant-bush
MS	<i>Leptospermum continentale</i>	Prickly Tea-tree
LH	<i>Lycopus australis</i>	Australian Gipsywort
LH	<i>Lythrum salicaria</i>	Purple Loosestrife
LH	<i>Persicaria praetermissa</i>	Spotted Knotweed
MH	<i>Hydrocotyle pterocarpa</i>	Wing Pennywort
MH	<i>Stellaria angustifolia</i>	Swamp Starwort
MH	<i>Lobelia anceps</i>	Angled Lobelia
SH	<i>Crassula helmsii</i>	Swamp Crassula
LTG	<i>Juncus procerus</i>	Tall Rush
LTG	<i>Poa labillardierei</i>	Common Tussock-grass
LNG	<i>Gahnia radula</i>	Thatch Saw-sedge
LNG	<i>Phragmites australis</i>	Common Reed
LNG	<i>Baumea rubiginosa</i> s.l.	Soft Twig-rush
MTG	<i>Triglochin procerum</i> s.l.	Water Ribbons
MTG	<i>Juncus gregiflorus</i>	Green Rush
MNG	<i>Eleocharis acuta</i>	Common Spike-sedge
GF	<i>Blechnum cartilagineum</i>	Gristle Fern
SC	<i>Calystegia sepium</i>	Large Bindweed

EVC 53: Swamp Scrub - Gippsland Plain bioregion

Recruitment:

Continuous

Organic Litter:

40 % cover

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
MH	<i>Hypochoeris radicata</i>	Cat's Ear	high	low
LNG	<i>Holcus lanatus</i>	Yorkshire Fog	high	high

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EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 83: Swampy Riparian Woodland

Description:

Woodland to 15 m tall generally occupying low energy streams of the foothills and plains. The lower strata are variously locally dominated by a range of large and medium shrub species on the stream levees in combination with large tussock grasses and sedges in the ground layer.

Large trees:

Species	DBH(cm)	#/ha
<i>Eucalyptus</i> spp.	70 cm	15 / ha

Tree Canopy Cover:

%cover	Character Species	Common Name
20%	<i>Eucalyptus ovata</i>	Swamp Gum
	<i>Eucalyptus radiata</i> s.l.	Narrow-leaf Peppermint

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Understorey Tree or Large Shrub	4	30%	T
Medium Shrub	5	20%	MS
Small Shrub	1	1%	SS
Prostrate Shrub	1	1%	PS
Large Herb	3	5%	LH
Medium Herb	7	10%	MH
Small or Prostrate Herb	3	5%	SH
Large Tufted Graminoid	3	15%	LTG
Large Non-tufted Graminoid	1	5%	LNG
Medium to Small Tufted Graminoid	5	10%	MTG
Medium to Tiny Non-tufted Graminoid	2	10%	MNG
Ground Fern	2	10%	GF
Scrambler or Climber	2	5%	SC
Bryophytes/Lichens	na	10%	BL

LF Code	Species typical of at least part of EVC range	Common Name
T	<i>Acacia melanoxylon</i>	Blackwood
T	<i>Melaleuca ericifolia</i>	Swamp Paperbark
T	<i>Leptospermum lanigerum</i>	Woolly Tea-tree
MS	<i>Leptospermum continentale</i>	Prickly Tea-tree
MS	<i>Coprosma quadrifida</i>	Prickly Currant-bush
MS	<i>Bursaria spinosa</i>	Sweet Bursaria
LH	<i>Senecio minimus</i>	Shrubby Fireweed
MH	<i>Gonocarpus tetragynus</i>	Common Raspwort
MH	<i>Acaena novae-zelandiae</i>	Bidgee-widgee
MH	<i>Hydrocotyle hirta</i>	Hairy Pennywort
SH	<i>Dichondra repens</i>	Kidney-weed
LTG	<i>Carex appressa</i>	Tall Sedge
LTG	<i>Cyperus lucidus</i>	Leafy Flat-sedge
LTG	<i>Lepidosperma elatius</i>	Tall Sword-sedge
LTG	<i>Juncus procerus</i>	Tall Rush
LNG	<i>Phragmites australis</i>	Common Reed
MTG	<i>Themeda triandra</i>	Kangaroo Grass
MTG	<i>Lomandra filiformis</i>	Wattle Mat-rush
MNG	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
GF	<i>Pteridium esculentum</i>	Austral Bracken

EVC 83: Swampy Riparian Woodland - Gippsland Plain bioregion

Recruitment:

Continuous

Organic Litter:

20 % cover

Logs:

20 m/0.1 ha.

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	<i>Cirsium vulgare</i>	Spear Thistle	high	high
LH	<i>Sonchus oleraceus</i>	Common Sow-thistle	high	low
MH	<i>Hypochoeris radicata</i>	Cat's Ear	high	low
MH	<i>Prunella vulgaris</i>	Self-heal	high	high
LNG	<i>Holcus lanatus</i>	Yorkshire Fog	high	high
MTG	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	high	high
MTG	<i>Briza maxima</i>	Large Quaking-grass	high	low

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www.dse.vic.gov.au

Appendix 8: Targeted Dwarf Galaxias Survey Report (Aquatica Environmental)

27 September 2017

Fiona Wiffrie
Beveridge Williams
1 Glenferrie Road
Malvern VIC 3144C/- Brett Macdonald
Brett Lane & Associates
Via email: BMacdonald@ecologicalresearch.com.au

Dear Fiona

RE: Nyora Targeted Dwarf Galaxias Survey**Introduction**

Aquatika Environmental (Aquatika and the trading name of Aquatika Australia Pty Ltd) was engaged by Brett Lane and Associates Pty Ltd (BL&A) on behalf of Beveridge Williams to undertake a Dwarf Galaxias *Galaxiella pusilla* survey at the location of a proposed subdivision and development in Nyora, Victoria (the project area, see Appendix A).

The project area included three parcels of currently undeveloped land including (see Appendix A):

- 30 Glovers Road, Nyora;
- 379 Lang Lang-Poowong Road, Nyora; and
- 951 Yannathan Road, Nyora.

As part of previous ecological assessments of the project area (including Biosis 2003), it was identified that aquatic habitat in the project area had the potential to support Dwarf Galaxias. Accordingly, Beveridge Williams, via BL&A, identified the requirement to undertake a targeted survey for the species to inform and support the project's relevant permits and approvals.

The aim of the targeted survey was to determine the likely presence/absence of Dwarf Galaxias in water bodies on, or near the site. If the species was to be present, or likely to be present, provide advice on the potential impact to Dwarf Galaxias and the relevant implications for development of the site.

Species Description – Dwarf Galaxias

Dwarf Galaxias are a small freshwater fish endemic to southeastern Australia occurring only in Victoria, South Australia and Tasmania. Typical maximum lengths are 40 millimetres (mm) for males and 34 mm for females with records up to 48 mm (Allen *et. al.* 2003) (Plate 1).

Although they are still widely distributed across southeastern Australia, populations are fragmented and patchy across the landscape (Saddler *et. al.* 2010). A decline in their abundance has been attributed to habitat loss due to wetland drainage, alterations to flow regimes, climate change, habitat damage (i.e. grazing and agriculture) and competition and predation by introduced fish species such as the Eastern Gambusia *Gambusia holbrooki* (Department of Environment 2017).

Dwarf Galaxias are a mid-water freshwater fish that spend their entire life cycle in freshwater environments. Their diet consists primarily of small aquatic macroinvertebrates. Spawning occurs in late winter to spring (May through to October) when females lay from 65 to 250 eggs on the underside of aquatic or submerged vegetation or on hard surfaces (Saddler *et. al.* 2010). They are a short-lived fish with only one year's age-class having been observed and adults dying after spawning, indicating they are an annual species (Humphries 1986 in Department of the Environment 2015).



Plate 1 Dwarf Galaxias (Photo: A. Jenkin)

Habitat requirements

Dwarf galaxias is a non-migratory species adapted primarily to wetland environments (Saddler *et. al.* 2010). Within wetland-type environments Dwarf Galaxias have a wide range of habitat requirements but typically occur in slow flowing and still, shallow, permanent and temporary, freshwater to slightly brackish waterways including wetlands, swamps, the backwaters of streams and creeks, drains and ditches, usually with dense aquatic, emergent or flooded vegetation (Allen *et. al.* 2003 and Saddler *et. al.* 2010). Tolerant of a wide range of variations in temperature, salinity and pH, they are only found at lower elevations.

The National Recovery Plan for Dwarf Galaxias (Saddler *et. al.* 2010) notes that Dwarf Galaxias have different habitat requirements depending on life stage and season including:

- **Transient habitat:** ephemeral habitat that retains water for less than one month following inundation and is mostly used for Dwarf Galaxias dispersal.
- **Spawning habitat:** ephemeral habitat with abundant aquatic or submerged vegetation that retain water for 1-3 months following inundation and during the May to October breeding season.
- **Short-term refuge habitat:** ephemeral water bodies that retain water for more than three months but do not have the attributes to support a permanent population.
- **Long-term refuge habitat:** permanent water bodies that provide permanent refuge for Dwarf Galaxias populations and where source stock can disperse and repopulate transient, spawning and short-term refuge habitats (i.e. those listed above).

Dwarf Galaxias are also known to seek refuge in freshwater crayfish/yabby burrows and is capable of aestivating (dormancy) in damp mud during drier periods (Wager & Jackson 1993; McDowall 1996 and Inland Fisheries Service 2000 in Department of Environment 2017).

Status

Legislative status

Dwarf Galaxias are listed as:

- Vulnerable under the Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act);
- Vulnerable on the DELWP Advisory List of Threatened Vertebrate Fauna (DEPI 2013);
- Threatened under the *Flora and Fauna Guarantee Act 1988* (the FFG Act) (DELWP 2017);
- Vulnerable on the International Union for Conservation of Nature (IUCN) Red List of Threatened Animals (Wager 1996); and
- the Australian Society for Fish Biology threatened species list (ASFB 2010).

Regional status

Dwarf Galaxias were likely once more widespread through the lower lying areas of the region. However, wetland modification and land uses such as wetland draining, farming and urban development have lead to a decline in much of their key habitat area (Department of Environment 2017).

Major threats to the Eastern Dwarf Galaxias in the region include:

- Wetland drainage;
- Alteration to the flow regime of waterways (i.e. changes to the natural flooding and drying cycles);
- Degradation and loss of habitat due to land development and lack of regeneration; and
- Introduced feral fish competitors and predators (Department of Environment 2017).

Project Area Description

The project area consisted primarily of open and undulating cattle grazing land with a small number of existing homesteads. Dominated by modified pasture, there were several fenced and planted tree belts, generally aligning with waterways in the project area.

Transecting the project area from south to north was a tributary of the upper reaches of the Little Lang Lang River, which in turn is a tributary of the Lang Lang River, that discharges into Western Port. Water bodies in the project area consisted namely of constructed farm dams linked by small flowing streams and drainage lines. All dams observed during the survey had steep culverts/discharge points at their downstream reaches.

Access to the 30 Glovers Road and 951 Yannathan Road properties was not available at the time of the survey. However, given their higher elevation and fewer water bodies (as assessed using aerial imagery), the assessment of these sites for

Dwarf Galaxias was considered not necessary for the purpose of determining the likelihood of occurrence of the species.

Methodology

Desktop Review

Aquatica Environmental conducted a desktop review of publically available biodiversity databases and other sources of information to identify existing records of Dwarf Galaxias and/or their habitat in the project area and its immediate vicinity.

Sources of information included:

- The federal Department of Environment and Energy's (DEE) *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST) using a 20 kilometre search radius of the project area;
- The Victorian Department of Environment, Land, Water and Planning's (DELWP) Victorian Biodiversity Atlas (VBA) for historical and/or recent records of Dwarf Galaxias within a 20 kilometre search radius of the project area;
- The DEE's Species Profile and Threats Database for Dwarf Galaxias;
- DELWP's Dwarf Galaxias Action Statement;
- The 2003 Flora and Fauna assessment of the project area (Biosis 2003); and
- A brief internet resources search for reports or other sources of information relating to Dwarf Galaxias in the study area.

Targeted Dwarf Galaxias Survey

Aquatica undertook a two-day/one-night targeted survey for Dwarf Galaxias in waterbodies on and near the project area. The survey commenced with a site reconnaissance, to identify waterways and water bodies that had suitable, or some suitable Dwarf Galaxias habitat elements.

Where potentially suitable Dwarf Galaxias habitat was identified, a survey of that habitat was undertaken. Sampling for adult Dwarf Galaxias was undertaken using hand-held dip-nets, bait traps (set with either phosphorescing stick or dry cat food) and fyke nets. Sampling for larval Dwarf Galaxias was undertaken by collecting a sample of water (approximately 10 litres) and placing it in a shallow white tray, where any larva would have been visible

Surveying using dip-nets and bait traps are standard methods for sampling Dwarf Galaxias and is one of the suite of suitable methods outlined in the Survey Guidelines for Australia's Threatened Fish (DSEWPaC 2004) and Biodiversity Precinct Structure Planning Kit (DSE 2010).

To provide context to the survey results, in situ water quality was measured and recorded using an InSitu DSS Pro multiparameter water quality meter. Parameters measured included temperature, pH, dissolved oxygen, electrical conductivity, total dissolved solids and turbidity (see raw data in Appendix C).

Results

Desktop Review

There were no existing records of Dwarf Galaxias identified in the project area or its immediate vicinity. The VBA indicated the closest existing records were in the Lang Lang River, upstream of its confluence with the Little Lang Lang River, approximately 10 kilometres north of the project area and from 2008 (Figure 1) (DELWP 2017).

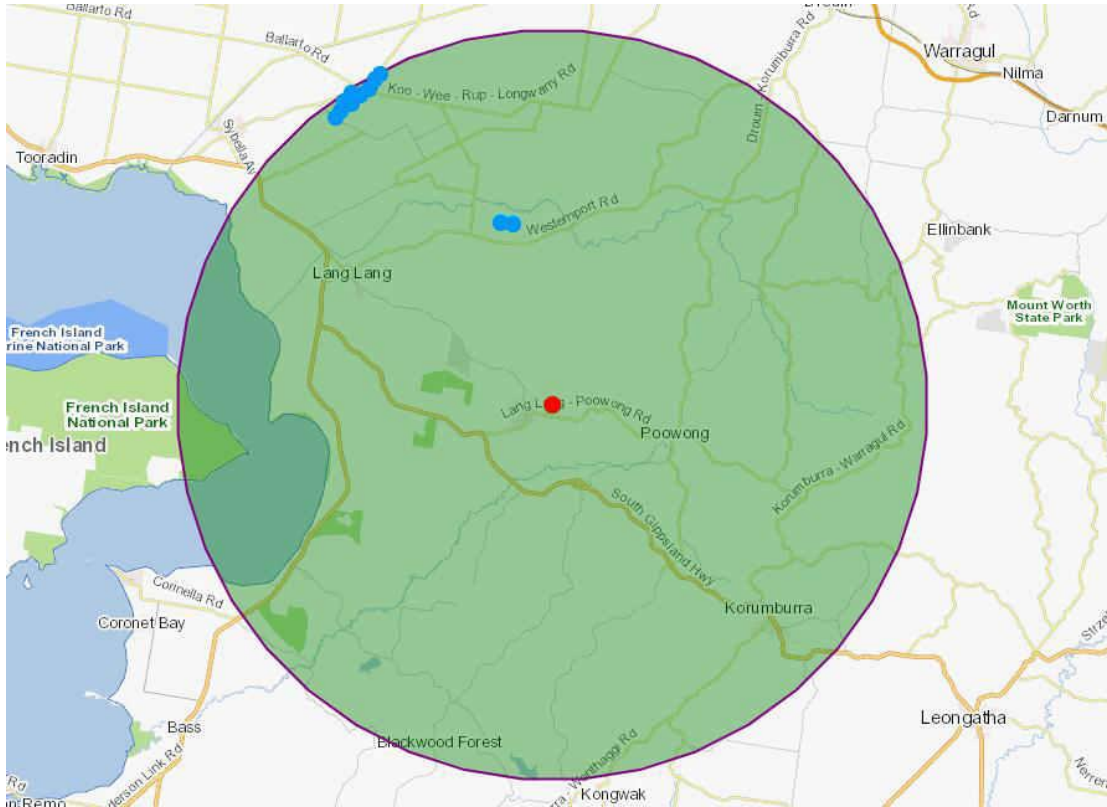


Figure 1 Existing Dwarf Galaxias records (●) within 20 kilometres of the project area (●) (Source: DELWP 2017)

Extensive fish surveys in the Little Lang Lang River, downstream of the project area, were undertaken in 2008 and 2009. Dwarf Galaxias were not recorded during these surveys with only a small number of common native and exotic fish species being recorded (DELWP 2017).

The 2003 study found that watercourses and waterbodies in and near the project area provided low-medium quality habitat for “some fish” with one anecdotal record of eels in the wetland to the south of the project area (Biosis 2003). The study concluded that the study area contained potential Dwarf Galaxias habitat but that hydrology was generally unfavourable for the species. Biosis recommended that further advice should be sought from an aquatic ecologist and a targeted survey undertaken to determine the status of the species in the study area.

Targeted Dwarf Galaxias Survey

The targeted survey was undertaken over two-days and one-night on 29/30th August 2017. Weather during the survey was cool and mostly fine to cloudy with light breezes. Temperatures ranged between 12.4°C (day time maximum) and 2.8°C (night time minimum) and 0.8 millimetres of rain fell over the two-day survey period.

Minimal Dwarf Galaxias habitat was observed in the study area, with only elements of Dwarf Galaxias’ complex habitat/niche requirements being observed. The two farm dams in the project area, were missing the dense vegetation and ephemeral nature typically required to support the species. Drainage/creek lines, similarly were missing the required dense vegetation, and flows were generally greater than that which the species could tolerate (other than for dispersal). The only location where moderate suitable habitat was observed was at the dam to the north of the project area (Site 6 near the Nyora Raceway).

Despite the lack of the full range of habitat niches required to support a population of Dwarf Galaxias, six survey sites were established in the highest potential habitat area including four in the project area and one upstream and one downstream of the project area (Figure 2). Table 1 outlines each of the sites including a site description and the survey methods deployed. Site photographs are provided in Appendix B.

No Dwarf Galaxias, or other fish species, were recorded during the survey. Only one macroinvertebrate was recorded at Site 6 (Burrowing Crayfish *Engaeus* sp.), as well as numerous crayfish burrows near Site 2 (Plate 2) and the calls of several common frog species at Sites 1, 3 and 5.

Water quality measurements were taken at each of the six sites in the study area, plus two additional sites a distance downstream near Lang Lang (see Appendix C). All sites in and downstream of the project area (e.g. Sites 1-4 and 6-8) returned measured water quality that was within acceptable levels to support Dwarf Galaxias. However, the water also showed high levels of tannin staining and foaming, indicating likely high levels of proteins (i.e. run-off from cattle handling areas).



Figure 2 Dwarf Galaxias survey sites (RED POINTS) in and near the project area (yellow polygon)(excluding the two extra downstream sites)

Table 1 Survey sites and site descriptions

Site No.	Description	Sampling method deployed	Species recorded	
			Common Name	Scientific Name
1	Project area's most downstream dam. Fringed mostly by Willow and other exotic plant species. Fenced, but some cattle access. Heavily tannin-stained water.	WQ, DN, BT, FN	Common Froglet	<i>Crinia signifera</i>

Site No.	Description	Sampling method deployed	Species recorded	
			Common Name	Scientific Name
2	Small stream on the discharge/downstream side of the farm dam. Step sided and eroding. Dominated by Willows in project area, but dense native vegetation on downstream side of fence. Heavily tannin-stained water and frothing/foaming of water observed.	WQ, DN, BT	Burrowing Crayfish (burrows only)	<i>Engaeus</i> sp.
3	Large farm dam. Fenced by some cattle access. Mostly submerged terrestrial vegetation at the fringes and some native plantings along the southern bank.	WQ, DN, BT, FN	Common Froglet	<i>Crinia signifera</i>
			Brown Treefrog	<i>Litoria ewingi</i>
4	Small wide drain on the discharge/downstream side of the Site 3. Step sided and eroding. Dominated by Willows. Some frothing/foaming of water observed	WQ, DN, BT	None	
5	Shallow dam/retention pond located upstream of the project area. Appears to be designed to receive sediments runoff form the upstream dirt race track. Occurs in a small reserve. Dominated by surrounding <i>Melaleuca</i> sp. and water surface choked with floating <i>Azolla</i> sp.	WQ, DN, BT	Peron's Treefrog	<i>Litoria peroni</i>
6	Main creek line through project area. Fenced and planted with established native overstory. No instream vegetation, but lots of fallen timber and undercut banks.	WQ, DN, BT	Burrowing Crayfish	<i>Engaeus</i> sp.
7	Located at bridge on Pooles Road near Lang Lang East. Reshaped section of the creek, with rock sidings and fast flows. Overstory dominated by Willow.	WQ	Not surveyed	
8	Located at bridge on Westernport Road on the north eastern side of Lang Lang. Steep sided and restructured section of the creek. Very weedy, dominated by Willow and Blackberry. Obvious increase in turbidity at this site, likely due to upstream quarry inputs.	WQ	Not surveyed	

Key: WQ = water quality, DN = dip-net, BT = bait trap, FN = fyke net



Plate 2 Female Burrowing Crayfish at Site 6 and burrow near Site 2



Plate 3 Discharge from the most downstream dam (Site 1) showing tannin staining and foaming

Discussion

Based on the results of the desktop review and targeted Dwarf Galaxias survey it is considered highly unlikely that the species occurs in, near or immediately downstream of the project area. There are a range of reasons supporting this assessment including:

- **No nearby records.** The nearest existing records were over 10 kilometres north of the project area in the Lang Lang River and from 2008. The VBA indicates that there are no major populations in the region immediately encompassing Nyora.
- **Poor quality and lack of suitable habitat.** The suitability of aquatic habitat in the study area for Dwarf Galaxias is low to negligible at best. Although there are some moderate quality habitat elements that may suit certain life stages for Dwarf Galaxias, the full range of habitats required to support a viable population where not present.
- **Inappropriate topography.** Dwarf Galaxias are more of a wetland/low land fish species. The project area lies at an elevation that is mostly too undulating/steep compared to the type of topography that is more reminiscent of regions that support Dwarf Galaxias.
- **Limited fish passage.** As was observed on all dams in the project area, steep discharge culverts would be mostly impassable by upstream discharging Dwarf Galaxias (and most other fish).

Given the low likelihood of occurrence of Dwarf Galaxias in or near the project area there are no planning or legislative implications for the project relating to the species.

However, as with any land development that occurs on a waterway, it will be essential to implement Water Sensitive Urban Design (WSUD) and waterway buffer zones into the landscape design to protect (and if possible enhance) aquatic habitat and water quality both in and downstream of the project area (see 'Nyora Stormwater Management Plan' available online). If any of the project area dams are to be decommissioned, the project's Environmental Management Plan (EMP) should consider the salvage and relocation of aquatic fauna. The project may also require a Works on Waterways permit, which would need to be obtained from the Port Phillip & Westernport Catchment Management Authority.

If you have any questions or would like to discuss this assessment, report or any other matter further, please do not hesitate to call me on 0413 935 497.

Kind Regards,

A handwritten signature in blue ink, appearing to read 'Aaron Jenkin', written in a cursive style.

Aaron Jenkin

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Appendix B: Site photographs

Site 1



Site 2



Site 3



Site 4



Site 5



Site 6



Site 7



Site 8



Appendix C: Water quality results for survey sites (in order of highest to lowest in catchment)

Parameter	Site	5	6	3	4	1	2	7*	8*
	Date	29/8/2017	29/8/2017	29/8/2017	29/8/2017	29/8/2017	29/8/2017	30/8/2017	30/8/2017
	Units								
Temperature	°C	8.5	11.2	10.4	8.1	7.9	8.9	8.9	12.0
Dissolved Oxygen	%	55.2	79.1	74.0	68.7	74.5	80.8	83.7	90.8
Dissolved Oxygen	ppm	6.48	8.68	8.25	8.10	8.83	9.36	9.67	9.77
Electrical Conductivity	µS/cm	87.8	146.1	158.2	149.9	154.7	198.3	564.0	425.0
Total Dissolved Solids	mg/L	83.941	129.039	142.504	143.765	149.202	186.383	529.374	367.774
Salinity	ppt	0.06	0.09	0.10	0.11	0.11	0.14	0.04	0.28
pH	pH units	6.55	6.75	6.75	6.62	6.55	6.63	7.42	7.00
Turbidity	NTU	209.4	7.1	10.3	24.9	24.0	32.8	20.1	137.9
Probe Depth**	m	0.003	0.000	0.000	0.000	0.000	0.002	0.000	0.000
Site Altitude	m	126.4	120.7	127.0	112.7	119.2	114.1	51.9	17.6

* Additional downstream water quality sites only.

** Measurements taken from a full bucket of collected site water resulting in effectively zero depth.

Appendix 9: Targeted Giant Gippsland Earthworm Survey Report (Invert-Eco)

Giant Gippsland Earthworm Assessment - Proposed Residential Subdivision at 951 Yannathan Road, 30 Glovers Road and 379 Lang Lang -Poowong Road, Nyora

September 2017



PREPARED FOR:

Brett MacDonald

Brett Lane & Associates Pty Ltd

REPORT AUTHOR:

Dr. Beverley Van Praagh

INVERT-ECO Consulting



INVERT-ECO



Terrestrial Invertebrate Consulting

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Title	<i>Giant Gippsland Earthworm Assessment - Proposed Housing development, 951 Yannathan Rd, 30 Glovers Rd and 379 Lang Lang -Poowong Rd, Nyora</i>



Revision List

Revision	Revision Date	Description of Revision	Reviewer
Revision 1	29/08/2017	First Draft	B. Van Praagh
Revision 2	13/09/2017	Final	Brett MacDonald

ABBREVIATIONS

SGSC: South Gippsland Shire Council

DELWP: Department of Environment, Land, Water and Planning

DoE: Department of the Environment

DOP: Development Plan Overlay

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999*

ESO4 Environmental Significance Overlay

FFG Act: *Flora and Fauna Guarantee Act 1988*

GGE: Giant Gippsland Earthworm, *Megascolides australis*

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ATTACHMENT 1 Contingency Plan for the accidental unearthing of Giant Gippsland Earthworms	
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EXECUTIVE SUMMARY

PROJECT BACKGROUND

INVERT-ECO was commissioned by Brett Lane & Associates Pty Ltd to undertake a targeted survey for the threatened Giant Gippsland Earthworm, *Megascolides australis* (GGE) at the site of a proposed residential development. The study area comprises 951 Yannathan Road, 30 Glovers Road and 379 Lang-Lang Poowong Road, Nyora.

A portion of the study area is covered by the South Gippsland Shire Council (SGSC) ESO9 – Gippsland Giant Earthworm Conservation Overlay and a Development Plan Overlay Schedule 10 (DPO10). Both include specific conditions in relation to the conservation of GGE when planning applications are proposed. This investigation was undertaken to identify any GGE colonies within the study area, assess potential impacts of the proposed development and advise on mitigation strategies to avoid or reduce environmental impacts on the species.

METHODS

A field assessment at 379 Lang Lang- Poowong Rd was undertaken by two workers on 21st August 2017 by digging soil quadrats to look for evidence of GGEs. The primary focus of the sampling was along the creek-banks of the tributaries of the Little Lang Lang River.

A desktop assessment of the likelihood of GGE occurring at 951 Yannathan Rd and 30 Glovers Rd was undertaken by reviewing site records, available mapping models, viewing aerial photography and parts of the study area from the adjacent property and roadside.

The field assessment was performed under optimal sampling conditions.

RESULTS

379 Lang Lang Poowong Rd

No evidence of GGE was recorded from within the study area. While some of the elements that typify potential habitat were identified along the creek banks e.g.-moist soils with buttercup and yabby mounds, none of the sites supported the appropriate clay based soils required by GGEs. All the soils found within the study area belong to the Nyora Map Unit (Association Victorian Recourses Online-west Gippsland {VRO}) which consist of soils with varying amounts of sand. GGE are absent from sandy soils as they require soils with a high clay component to build their permanent burrow systems and retain moisture (Van Praagh *et. al.* 2004).

951 Yannathan Rd and 30 Glovers Rd

Based on aerial photography and visual inspection from the road, the VRO mapping data and the results of the GGE assessment of the adjoining property, it is most likely that these two properties do not contain any suitable GGE habitat. There are no waterways located on the properties (GGE are most commonly found along the banks of waterways) and the sites are comprised of soils belonging to the Nyora Map Unit Association (VRO). This indicates that the sites consist of sandy soils, similar to the those found at 379 Lang Lang Poowong Rd.

While GGE records are found relatively close to the study area, Nyora is on the south western edge of the species range and the GGE records occur in basaltic soils with clay loams to silty clay loams from the Strzelecki and Ripplebrook Soil Association.

POTENTIAL IMPACTS AND LEGISLATION

Potential impacts to GGE colonies from housing developments include direct impacts from excavation works in GGE habitat and indirect impacts from altered hydrological processes including changes that cause flooding or drying of the habitat. Appropriate hydrological conditions are a critical component of suitable GGE habitat.

As no evidence of GGE was recorded from the 379 Lang Lang Poowong Rd and there is an extremely low likelihood of the species occurring at 951 Yannathan Rd and 30 Glovers Rd, there are no impacts to GGE colonies anticipated from the proposed residential development.

Information regarding legislative compliance and GGE can be found in Section 5. In summary :

- This assessment supports the requirements for a GGE survey where developments are mapped as potential habitat under the ES09 and where a Development Plan Overlay Schedule 10 applies.
- Results of this GGE assessment must be presented in a planning permit application to South Gippsland Shire Council as outlined in the Planning Permit Pathway under the ES09.
- The proposed action is unlikely to have a significant impact on the Giant Gippsland Earthworm as they were not recorded within the study area. As such, a referral to the Commonwealth Minister is unlikely to be required.
- A permit under the *FFG Act 1999* is not required in relation to GGE.

1 INTRODUCTION

1.1 Project Background

INVERT-ECO was commissioned by Brett Lane & Associates Pty Ltd to undertake a targeted survey for the Giant Gippsland Earthworm (GGE) at the site of a proposed residential development. The study area comprises three properties including 951 Yannathan Road, 30 Glovers Road and 379 Lang-Lang Poowong Road, Nyora.

A portion of the study area is covered by the South Gippsland Shire Council (SGSC) ESO9 – Gippsland Giant Earthworm Conservation Overlay. A Development Plan Overlay Schedule 10 (DPO10) also applies to the land which includes conditions specific to the conservation of GGE. As a consequence, a GGE assessment is required to support a permit application for the proposed residential development.

The Giant Gippsland Earthworm (*Megascolides australis*) is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Threatened under the *Victorian Flora and Fauna Guarantee Act 1988* (FFG Act) (See section 1.4 for further information).

This investigation was undertaken to assess potential impacts of the proposed development on any GGE colonies identified and advise on mitigation strategies to avoid or reduce environmental impacts on the species. This will inform legislative and planning requirements by SGSC and the Department of Environment, Land, Water & Planning (DELWP).

1.2 Scope of Assessment

The specific objectives of this assessment are:

- Conduct a targeted field survey for the Giant Gippsland Earthworm at 379 Lang Lang Poowong Rd,
- Undertake a desktop assessment to determine the likelihood of GGE occurring at 951 Yannathan Rd and 30 Glovers Rd, Nyora,
- Provide mitigation options to protect GGE colonies should they occur within areas to be impacted by the proposed residential development.

1.3 Study Area

The study area is approximately 104 ha and is situated on the outskirts of Nyora, bound by Lang Lang Poowong Rd to the south and Yannathan Rd, to the west (Figure 1&2). It comprises three properties, including 951 Yannathan Road, 30 Glovers Road and 379 Lang-Lang Poowong Road, Nyora. The first two properties were assessed via a desktop assessment, while a field assessment was undertaken at 379 Lang-Lang Poowong Road, Nyora (see Figure 2).

The land has recently been rezoned from Farming Zone (FZ) to General Residential Zone 1 (GRZ1) and is identified in the Nyora Framework Plan as 'Future Residential Area' and 'Long Term Residential Area'. The land is covered by the ESO9 and DPO (10).

The topography of the land is one of low, rolling hills (Plate 1). Several tributaries of the Little Lang Lang River flow through the site (Plate 2). The site is comprised primarily of introduced pasture and has a long history of grazing. Remnant patches of native vegetation occur across the site, particularly along the watercourses.

Figure 1 Location of study area at Nyora

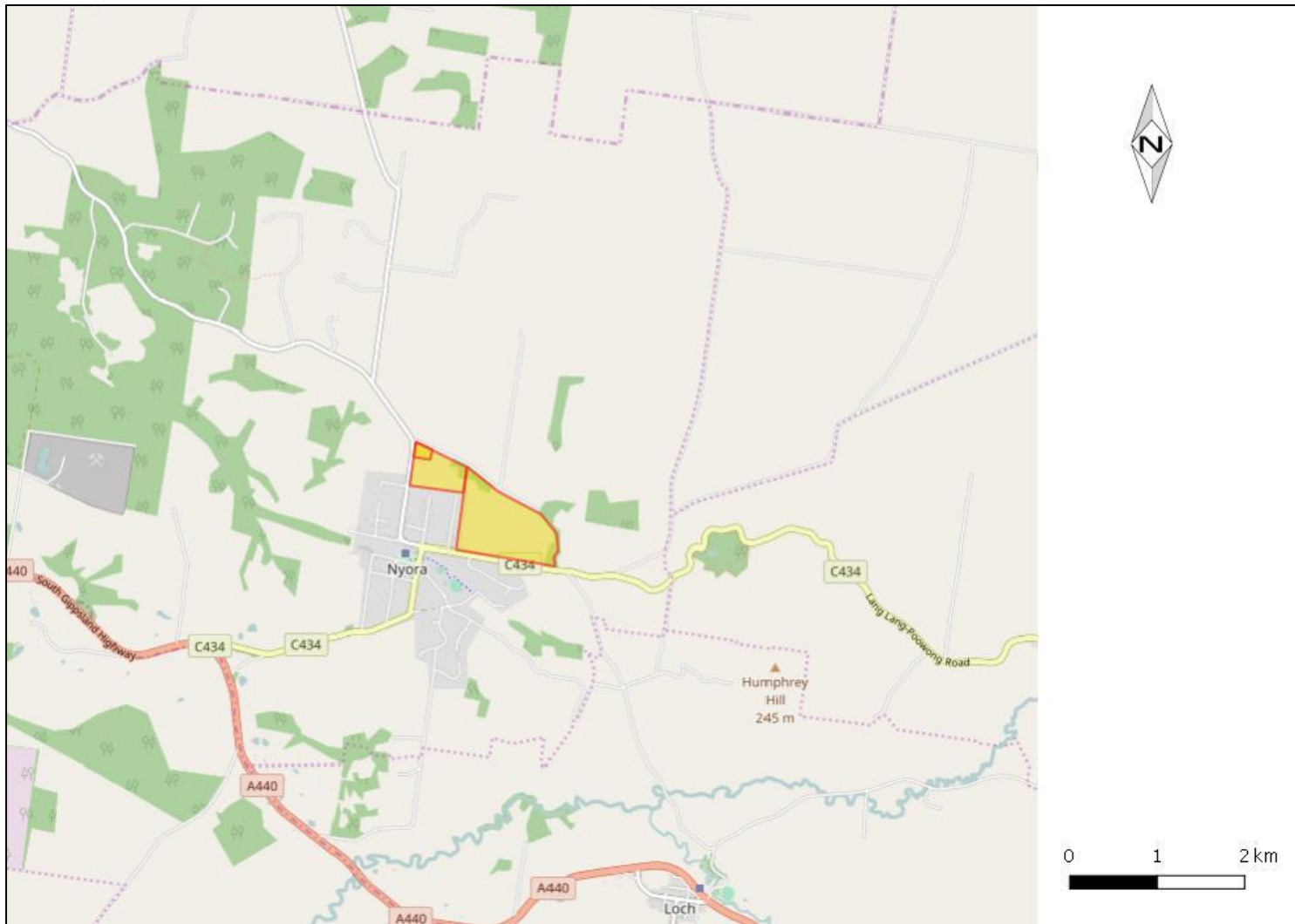


Figure 2 Location of GGE Desktop and Field Assessment Areas

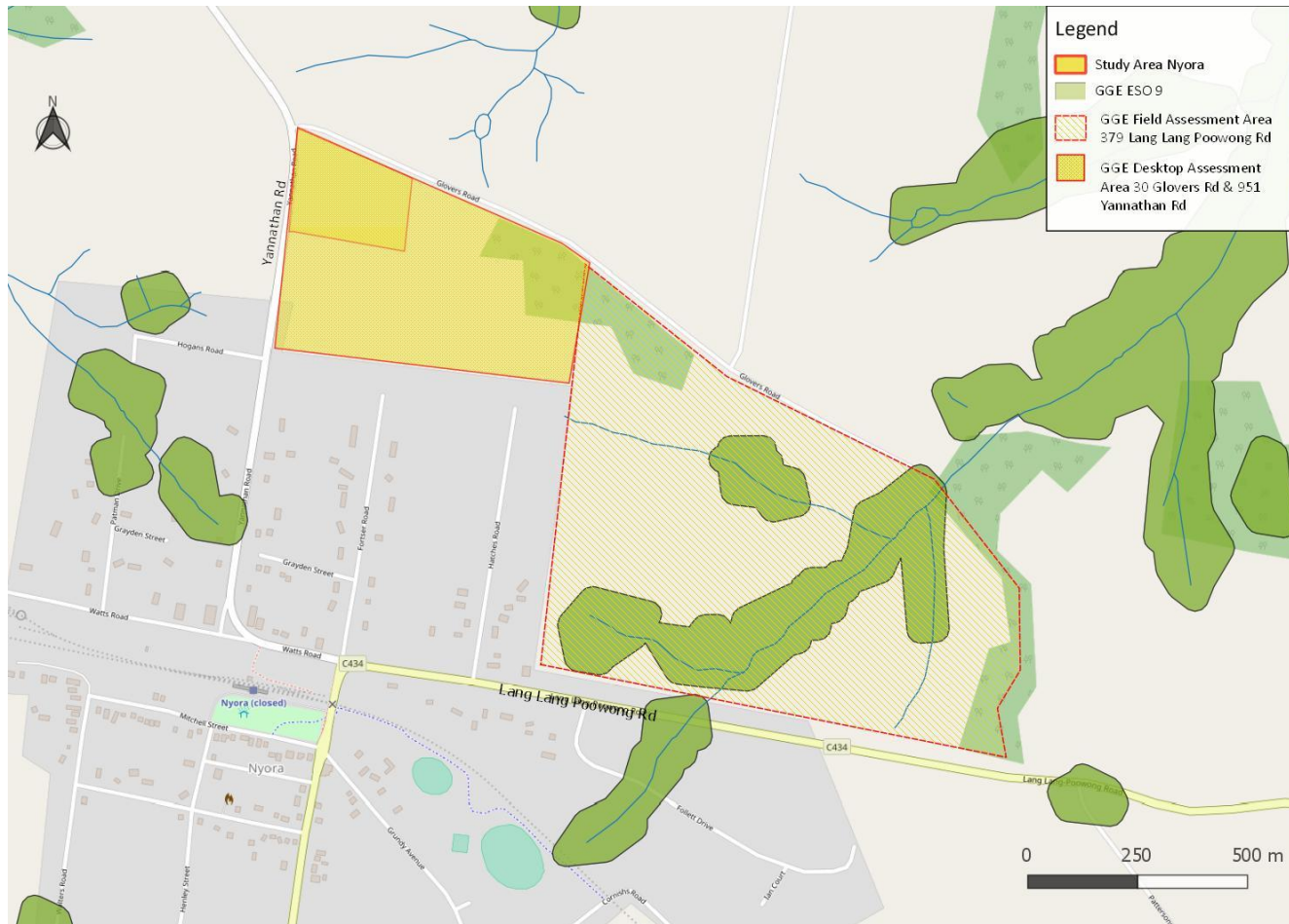




Plate 2 General landscape features of 397 Lang Lang Poowong Rd, Nyora



Plate 1 Tributaries of the Little Lang Lang River targeted for GGE assessment

1.4 Giant Gippsland Earthworm

EPBC Act 1999 Conservation Status: Vulnerable
FFG Act 1988 Conservation Status: Threatened
 IUCN Red List of Threatened Species (2015): Endangered
 DEPI Advisory List of Threatened Invertebrates
 (2009): Listed



Plate 3 Giant Gippsland Earthworm

The Giant Gippsland Earthworm is one of the largest species of earthworm in the world, with adults reaching lengths of over 1.5 m and weights of up to 400 g (Van Praagh 1992) (Plate 3). The species is restricted to south and west Gippsland, Victoria with Warragul and Drouin representing the north of its range and Almurta and Korumburra in the south. Mt Worth represents the most easterly point of distribution.

Nyora is situated on the south-western edge of the species range (Appendix 1). GGE have been recorded within 500 m south east of the study area along Pattersons Rd (Invert-Eco records). Extensive records occur from around the townships of Loch and Poowong to the south and south east of the site.

The majority of habitat occupied by this species occurs on private land used for agriculture. GGE colonies are most commonly found along clayey creek banks and drainage lines, usually above the areas prone to flooding. Away from waterways, they occur near underground springs and soaks, either in gullies or on south-facing slopes with terracettes. The soils in the north of the species range are developed on Tertiary (older) Volcanic basalts compared with those in the south that are derived from the lower cretaceous sedimentary rock (Sargeant 1975, Smith and Peterson 1982).

While the species occurs over an area of approximately 40,000 ha, areas of suitable habitat within its range are patchy leading to small, fragmented populations. A combination of many interrelated factors such as slope, micro-topography, nature and depth of the soil and hydrological processes determine suitable habitat (Van Praagh *et.al.* 2007).

Aspects of the biology and ecology of the GGE such as long lifespan, low reproductive and recruitment rates, and poor dispersal ability render the fragmented populations particularly vulnerable to threatening processes (Van Praagh 1992). There are a range of processes that threaten GGE colonies. The most widespread and serious are the physical disturbance and compaction of soils, alterations to water tables and drainage patterns at the local and regional level.

For further information visit <http://www.giantearthworm.org.au/>

2 METHODS

2.1 Field Survey

A survey to establish the presence of the Giant Gippsland Earthworm involves inspecting the study area for the presence of suitable habitat (stream banks, soaks and south facing hillslopes) and targeting these areas for sampling. As there are no above ground signs to indicate whether this species is present, sampling involves digging quadrats of approximately 50 cm x 50 cm to examine the soil for evidence of GGGs. Evidence includes burrows and cast (waste) material. The presence of wet burrows indicates that a worm is occupying that burrow. If the ground is wet, presence of the worms can sometimes be established by banging the ground with a spade and listening for “gurgles”, the sound that is made when the worms retreat down their burrows.

A field assessment at 279 Lang Lang-Poowong Rd was undertaken by two surveyors on 21st August 2017. Sampling was concentrated along the banks of the four main tributaries of the Little Lang Lang River. Quadrats were dug at various intervals to examine the soil type and look for GGE burrows. The banks of several dams were also assessed in addition to random sites across the paddocks and away from the waterways.

2.2 Desktop assessment of 951 Yannathan Rd and 30 Glovers Rd, Nyora

Invert-eco has assessed the likelihood of GGE occurring within 951 Yannathan Rd and 30 Glovers Rd by:

- Undertaking a review of locality records and available mapping models for GGEs to assess distribution,
- Assessing the study area using aerial photography to determine the suitability of the habitat to support this species,
- Viewing parts of the study area from the adjacent property and roadside.

AMG data was recorded using a hand held GPS (GDA 94, accuracy ± 5 m).

2.2 Assessment Qualifications and Limitations

The optimum time to detect GGE is in the wetter months of the year or after recent rainfall. Conditions were good at the time of sampling and are considered relatively robust. Due to the cryptic habits this species, even when extensive surveys have been undertaken, there is still a risk that colonies may remain undetected. The risk for the GGE is addressed by a contingency plan for the accidental exposure of the Giant Gippsland Earthworms (see Section 6, Attachment 1).

3 RESULTS

3.1 379 Lang Lang-Poowong Rd

No evidence of GGE was recorded from within the study area. While some of the elements that typify potential habitat were identified along the creek banks e.g.-moist soils with buttercup and yabby mounds (see Plate 2), none of the sites supported the appropriate soil types required by GGEs. Several factors that characterise potential GGE habitat have been identified including proximity to water, soil hydrology and soil type (Smith and Peterson 1982, Van Praagh 1994, Van Praagh *et. al.* 2004, 2007). The species is generally found in acidic, silty clay loam and heavy clay soils, generally blue grey or red in appearance and found in the Strzelecki, Warragul and Ripplebrook soil associations described by Sargeant (1975).

All the soils found within the study area belong to the Nyora Map Unit Association (Victorian Recourses Online-west Gippsland {VRO}). Soils of the Nyora map unit have grey or dark grey loamy fine sand or loamy sand surfaces with low to moderate amounts of organic matter. At around 30 cm, dark brown mottled with light grey and light yellow-brown cemented sands often form a very compacted, cemented layer comprising humus and iron oxides. Below the coffee rock, paler-coloured and mottled sands overlying Tertiary sediments generally occur. These types of sandy soils were encountered along the creek-banks and within the paddocks (Plate 4). The only place clay soils were found was around several of the dams, most likely a result of the soils used in the dam construction.

GGE are absent from soils with a high coarse sand content as they require soils with a high clay component to build their permanent burrow systems and retain appropriate soil moisture conditions year round to maintain colonies (Van Praagh *et. al.* 2004). Many of the creek banks were also water-logged and prone to flooding. This also reduced their suitability to provide GGE habitat. Subsoil and surface hydrology play a key role in Giant Gippsland Earthworm distribution (Van Praagh *et al.* 2007) and while adequate soil moisture maintained year round is important for this species, it appears to be unable to survive in poorly drained soils.

3.2 30 Glovers Rd and 951 Yannathan Rd

Based on aerial photography and visual inspection from the road, the VRO mapping data and the results of the GGE assessment of the neighbouring property, it is very likely that these two properties do not support any suitable GGE habitat. There are no waterways located on the properties (GGE are most commonly found along the banks of waterways) and the sites are comprised of soils belonging to the Nyora Map Unit Association (VRO). This indicates that the sites consist of sandy soils, similar to the those found at 379 Lang Lang Poowong Rd.

While GGE records are found relatively close to the study area, Nyora is on the edge of the species range and the records they occur in a different soil type. There is a change in the soil west of Poowong where the dominant soil type is from the Strzelecki

Association with some soils from the Ripplebrook Association (VRO). These are largely derived from basaltic soils with clay loams to silty clay loams. It is in these soils that GGE are most commonly recorded.



Plate 4 Soils with varying amounts of sand found at 379 Poowong Lang Lang Rd, Nyora

4 POTENTIAL IMPACTS

General Threats

Most threats to GGE colonies involve disturbances to their soil habitat (physical and chemical) and alteration to local drainage patterns and water table levels. Any type of earthworks that disturb the soil can impact GGEs both directly and indirectly. Digging in GGE habitat destroys earthworm burrows and may kill individual earthworms and egg cocoons. This species is very fragile and individuals do not recover well, even from minor injury. Indirect impacts include compaction, contamination and actions that alter soil hydrological conditions. General threats associated to GGE habitat can be found in Table 1.

As no evidence of GGE was recorded from the study area there are no impacts to GGE colonies anticipated from the proposed residential development.

There are no impacts to **GGE** colonies anticipated from the proposed residential development as the study area did not support suitable habitat. The species was not recorded from 379 Lang Lang Poowong Rd and there is an extremely low likelihood of the species occurring at 51 Yannathan Rd and 30 Glovers Rd.

Table 1 General Threats to GGE Colonies

Threats	Impact
<p>Direct Disturbance</p> <p>Excavation of habitat for:</p> <ul style="list-style-type: none"> - Housing, dams, pipelines and road construction - Roads, pipeline installation - Fill and alteration to natural topography - Soil compaction and churning from machinery <p>Chemical disturbances</p> <ul style="list-style-type: none"> -Run-off of pollutants, use of weedicides and herbicides. <ul style="list-style-type: none"> - Removal of existing vegetation - Destruction of stream bank integrity 	<p>Loss and degradation of habitat</p> <p>Death and injury of individuals and egg cocoons</p> <p>Fragmentation of colonies & reduced gene flow</p> <p>Compaction and churning of soil resulting in loss of burrows</p> <p>Exposing burrows, changing hydrology and causing drying out of sites;</p>
<p>Hydrological Disturbance (within or adjacent to habitat)</p> <ul style="list-style-type: none"> -Reduction or increase in surface and subsurface flows -Alteration of water table (drying or flooding) -Dense revegetation within or adjacent to habitat 	<p>Direct loss of habitat</p> <p>Loss of colonies</p> <p>Fragmentation of colonies & reduced gene flow</p> <p>Drying out of soils</p> <p>Clearing of riparian vegetation</p>
<p>Changes in water quality</p> <ul style="list-style-type: none"> -Run-off from roads and housing 	<p>Degradation of habitat through reduced water quality</p>

5 ENVIRONMENTAL POLICY AND LEGISLATION

This section explores environmental policy and legislation most pertinent to the Giant Gippsland Earthworm. However, it is not a comprehensive list of all legislation and the guidance provided does not constitute legal advice.

5.1 *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for assessment of proposed actions that are likely to have a significant impact on Matters of National Environmental Significance (NES). It applies to both public and private land.

A proponent is obliged to refer matters of NES the Commonwealth Environment Minister if an action is likely to have a significant impact to an endangered or critically endangered species, or on an 'important population' or critical habitat of a listed vulnerable species. The Department of Environment decides whether there will be a significant impact and if it needs to be a 'controlled action' and requires a formal assessment under the Act.

As the Giant Gippsland Earthworm is listed as **Vulnerable** under the EPBC Act, a referral to the Commonwealth Minister for DEWHA may be necessary if the works are deemed to have a significant impact on an **important population**. The criteria to consider in determining an important population under the Act are outlined below and the significant impact criteria for Vulnerable species are given in Table 2.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Table 2 Summary of significant impact criteria for *Vulnerable* EPBC Act listed

Significant Impact Criteria
Criteria 1: Lead to a long-term decrease in size of an important population of a species
Criteria 2: Reduce the area of occupancy of an important population
Criteria 3: Fragment an important population into two or more populations
Criteria 4: Adversely affect habitat critical to the survival of a species
Criteria 5: Disrupt a breeding cycle of an important population
Criteria 6: Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
Criteria 7: Result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat
Criteria 8: Introduce disease that may cause the species to decline
Criteria 9: Interfere substantially with the recovery of the species.

At present, there is insufficient information available to determine 'important' populations. However, the following factors that could be considered when assessing whether or not a GGE population/colony is "important":

- Relationship of colony to known distribution (outliers may have higher conservation significance)
- Size of the area occupied by the colony
- Density of colony
- Long term viability of the colony
- Evidence of recent activity (e.g. wet burrows and gurgles)
- Evidence of breeding (e.g. cocoons or breeding adults)
- Area of impact in relation to colony size
- Has been the subject of long-term monitoring

Implications

The proposed residential development will not have a significant impact on the Giant Gippsland Earthworm as they were not recorded within the study area.

Further advice can be sought from the Department of Environment (DOE).

<http://www.environment.gov.au/epbc/publications/significant-impact-guidelines-11-matters-national-environmental-significance>).

A referral under the *EPBC Act 1999* is not required for GGE in relation to this proposed residential development.

5.2 Flora and Fauna Guarantee Act

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. The FFG Act lists:

- Threatened species of flora and fauna (genera, species, subspecies, varieties);
- Threatened communities of flora and fauna (the Threatened List);
- Protected flora; and
- Potentially threatening processes (the processes list).

Further information on the FFG Act can be found at:

<http://www.depi.vic.gov.au/environment-and-wildlife/threatened-species-and-communities/flora-and-fauna-guarantee-act-1988>

Implications

A permit is required from DELWP if an action on public land proposes to collect, kill, injure or disturb protected flora and fauna and ecological communities. An FFG Act permit is generally not required for private land.

An *FFG Act* is not required in relation to GGE for this proposal as they were not recorded from the study area and no suitable habitat was identified.

5.3 Wildlife Act 1975

This Act forms the procedural, administrative and operational basis for the protection and conservation of native wildlife, specific use of, and prescriptions for access, prohibition and regulation of associated activities involving native wildlife within Victoria. This Act is the basis for the majority of wildlife permit/licensing requirements within the state. All terrestrial invertebrates listed under the *FFG Act 1988* are considered “wildlife”.

Implications

The GGE is listed under the *FFG Act* and are thus considered “wildlife” for the purposes of this Act. A license is required under this Act to take or destroy wildlife. This includes any handling, salvage and translocation. It is not anticipated that any of these activities in relation to GGE will result from this proposal.

5.4 Victorian Planning Provisions

A number of state and local planning provisions require that local planning authorities give due consideration to the conservation requirements of threatened species and those listed under the *FFG Act*. The relevant provisions include Development Plan Overlays which serve to implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies.

- *Development Plan Overlay (DPO)*

Schedule 10 of the Development Plan Overlay states that:

A flora and fauna report prepared by a suitably qualified person. The report(s) must consider:

A survey and assessment of impacts of the proposed development plan layout on the Giant Gippsland Earthworm habitat. This assessment must be conducted by a suitably qualified person to the satisfaction of the Department of Environment, Land, Water and Planning and the responsible authority

Implications

This assessment supports the requirement to undertake a GGE survey and assessment of impacts of the proposed development.

Results of GGE survey and habitat assessment must be presented in a planning permit application to South Gippsland Shire Council.

5.5 Significance Overlays

Each municipality in Victoria is covered by a planning scheme, which sets out policies and provisions for the use, development and protection of land (zones and overlays). An overlay is a planning provision intended to ensure that important aspects of the land are recognised. Overlays indicate the type of development and/or protection, which may be appropriate in that area. This overlay details planning pathways to facilitate proponent requirements for planning applications where Giant Gippsland Earthworms have the potential to occur.

Development applications for land covered by GGE ES09 must be accompanied by an assessment of the potential impact on GGE habitat and must indicate how this negative impact has been avoided, minimised or offset.

Implications

This assessment supports the requirement to undertake a site assessment for developments mapped as potential GGE habitat under the ES09.

Results of GGE survey and habitat assessment must be presented in a planning permit application to South Gippsland Shire Council.

6 IMPACT MINIMISATION RECOMMEDATIONS

No GGE colonies should be impacted by the proposed residential development at 379 Lang Lang Poowong Rd, 30 Glovers Road, and 951 Yannathan Rd, Nyora as no evidence of the species was found and no suitable habitat identified. As a consequence, there are no impact minimisation recommendations required in relation to Giant Gippsland Earthworms.

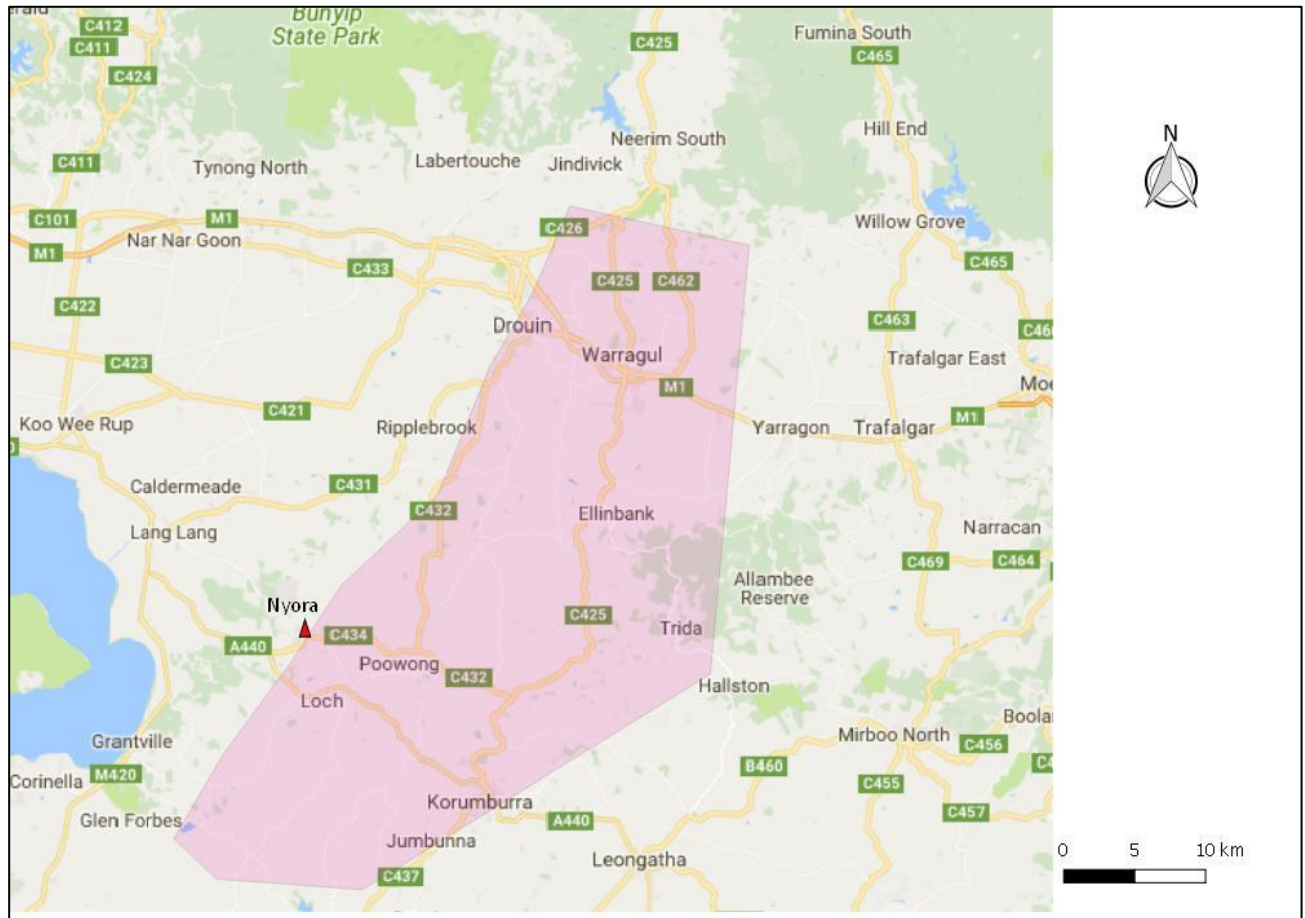
Although it is very unlikely any unidentified GGE colonies would be accidentally uncovered as a result of this proposal, it is still a small risk given the size of the study area and the cryptic nature of this species. It is therefore recommended that:

- All key personnel working on the project take part in a site induction so that they are familiar with the identification of GGEs and the procedure should any undetected GGE populations be discovered (Attachment 1).

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APPENDIX 1 Polygon of GGE distribution range in relation to study area at Nyora



Appendix 10: Native Vegetation Removal (NVR) report

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*. The report **is not an assessment by DELWP** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Date of issue: 26/10/2018

Report ID: BLA_2018_190

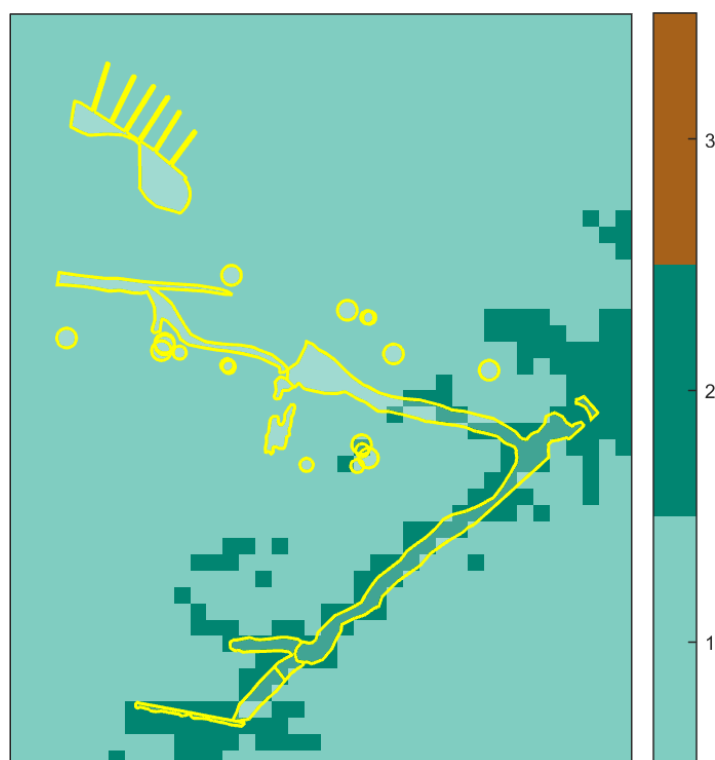
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Assessment pathway

Assessment pathway	Detailed Assessment Pathway
Extent including past and proposed	5.949 ha
Extent of past removal	0.000 ha
Extent of proposed removal	5.949 ha
No. Large trees proposed to be removed	59
Location category of proposed removal	Location 2 The native vegetation is in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map). Removal of less than 0.5 hectares of native vegetation in this location will not have a significant impact on any habitat for a rare or threatened species.

1. Location map



Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount¹	2.717 general habitat units
Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or South Gippsland Shire Council
Minimum strategic biodiversity value score ²	0.353
Large trees	59 large trees

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

¹ The general offset amount required is the sum of all general habitat units in Appendix 1.

² Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

This *Native vegetation removal report* must be submitted with your application for a permit to remove, destroy or lop native vegetation.

Refer to the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) for a full list of application requirements. This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway
- A description of the native vegetation to be removed (partly met)
- Maps showing the native vegetation and property (partly met)
- Information about the impacts on rare or threatened species.
- The offset requirements determined in accordance with section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs
- Details of past native vegetation removal
- An avoid and minimise statement
- A copy of any Property Vegetation Plan that applies
- A defensible space statement as applicable
- A statement about the Native Vegetation Precinct Plan as applicable
- A site assessment report including a habitat hectare assessment of any patches of native vegetation and details of trees
- An offset statement that explains that an offset has been identified and how it will be secured.

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Obtaining this publication does not guarantee that an application will meet the requirements of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes or that a permit to remove native vegetation will be granted.

Notwithstanding anything else contained in this publication, you must ensure that you comply with all relevant laws, legislation, awards or orders and that you obtain and comply with all permits, approvals and the like that affect, are applicable or are necessary to undertake any action to remove, lop or destroy or otherwise deal with any native vegetation or that apply to matters within the scope of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes.

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

$$\text{Species habitat units} = \text{extent} \times \text{condition} \times \text{species landscape factor} \times 2, \text{ where the species landscape factor} = 0.5 + (\text{habitat importance score}/2)$$

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

$$\text{General habitat units} = \text{extent} \times \text{condition} \times \text{general landscape factor} \times 1.5, \text{ where the general landscape factor} = 0.5 + (\text{strategic biodiversity value score}/2)$$

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Zone	Information provided by or on behalf of the applicant in a GIS file						Information calculated by EnSym					
	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-1	Scattered Tree	gjpp0016	Vulnerable	0	no	0.200	0.031	0.031	0.400		0.007	General
1-2	Scattered Tree	gjpp0016	Vulnerable	0	no	0.200	0.031	0.028	0.400		0.006	General
1-3	Scattered Tree	gjpp0016	Vulnerable	0	no	0.200	0.031	0.001	0.400		0.000	General
1-4	Scattered Tree	gjpp0016	Vulnerable	1	no	0.200	0.070	0.066	0.380		0.014	General
1-5	Scattered Tree	gjpp0016	Vulnerable	1	no	0.200	0.070	0.066	0.400		0.014	General
1-6	Scattered Tree	gjpp0016	Vulnerable	1	no	0.200	0.070	0.070	0.300		0.014	General
1-7	Scattered Tree	gjpp0016	Vulnerable	0	no	0.200	0.031	0.019	0.300		0.004	General
1-8	Scattered Tree	gjpp0016	Vulnerable	0	no	0.200	0.031	0.019	0.300		0.004	General

Information provided by or on behalf of the applicant in a GIS file										Information calculated by EnSym				
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type		
1-9	Scattered Tree	gipp0016	Vulnerable	1	no	0.200	0.070	0.070	0.303		0.014	General		
1-10	Scattered Tree	gipp0016	Vulnerable	1	no	0.200	0.070	0.070	0.630		0.017	General		
1-23	Scattered Tree	gipp0016	Vulnerable	0	no	0.200	0.031	0.016	0.270		0.003	General		
1-24	Scattered Tree	gipp0016	Vulnerable	0	no	0.200	0.031	0.006	0.270		0.001	General		
1-25	Scattered Tree	gipp0016	Vulnerable	0	no	0.200	0.031	0.017	0.270		0.003	General		
1-27	Scattered Tree	gipp0016	Vulnerable	1	no	0.200	0.070	0.050	0.270		0.009	General		
1-28	Scattered Tree	gipp0016	Vulnerable	1	no	0.200	0.070	0.019	0.270		0.004	General		
1-29	Scattered Tree	gipp0016	Vulnerable	1	no	0.200	0.070	0.039	0.270		0.007	General		
1-30	Scattered Tree	gipp0016	Vulnerable	1	no	0.200	0.070	0.070	0.280		0.014	General		
1-31	Scattered Tree	gipp0016	Vulnerable	1	no	0.200	0.070	0.070	0.480		0.016	General		
1-F	Patch	gipp0053	Endangered	0	no	0.340	0.730	0.730	0.335		0.248	General		
1-G	Patch	gipp0083	Endangered	3	no	0.300	0.053	0.053	0.300		0.016	General		
1-H	Patch	gipp0016	Vulnerable	3	no	0.370	0.165	0.165	0.328		0.061	General		
1-E	Patch	gipp0016	Vulnerable	17	no	0.500	0.956	0.956	0.478		0.530	General		
1-I	Patch	gipp0053	Endangered	0	no	0.350	0.286	0.286	0.571		0.118	General		
1-A	Patch	gipp0083	Endangered	26	no	0.500	2.621	2.621	0.465		1.441	General		
1-I	Patch	gipp0053	Endangered	0	no	0.350	0.240	0.240	0.533		0.097	General		

Information provided by or on behalf of the applicant in a GIS file						Information calculated by EnSym						
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-26	Scattered Tree	gjpp0053	Endangered	0	no	0.200	0.031	0.031	0.270		0.006	General
1-E	Patch	gjpp0016	Vulnerable	0	no	0.500	0.040	0.040	0.630		0.025	General
1-J	Patch	gjpp0053	Endangered	0	no	0.260	0.051	0.051	0.390		0.014	General
1-K	Patch	gjpp0053	Endangered	0	no	0.280	0.049	0.049	0.390		0.014	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Strzelecki Gum	<i>Eucalyptus strzeleckii</i>	504558	Vulnerable	Dispersed	Habitat importance map	0.0013
Australian Grayling	<i>Prototroctes maraena</i>	4686	Vulnerable	Dispersed	Habitat importance map	0.0013
Spurred Helmet-orchid	<i>Corybas aconitiflorus</i>	500835	Rare	Dispersed	Habitat importance map	0.0004
Mauve-tuft Sun-orchid	<i>Thelymitra malvina</i>	503374	Vulnerable	Dispersed	Habitat importance map	0.0003
Green-striped Greenhood	<i>Pterostylis chlorogramma</i>	504728	Vulnerable	Dispersed	Habitat importance map	0.0002
Cobra Greenhood	<i>Pterostylis grandiflora</i>	502798	Rare	Dispersed	Habitat importance map	0.0002
Grey Goshawk	<i>Accipiter novaehollandiae novaehollandiae</i>	10220	Vulnerable	Dispersed	Habitat importance map	0.0001
Orange-tip Finger-orchid	<i>Caladenia aurantiaca</i>	500523	Rare	Dispersed	Habitat importance map	0.0001
Australasian Shoveler	<i>Anas rhynchos</i>	10212	Vulnerable	Dispersed	Habitat importance map	0.0001
Hardhead	<i>Aythya australis</i>	10215	Vulnerable	Dispersed	Habitat importance map	0.0001
Swamp Skink	<i>Lissolepis coventryi</i>	12407	Vulnerable	Dispersed	Habitat importance map	0.0000
Southern Toadlet	<i>Pseudophryne semimarmorata</i>	13125	Vulnerable	Dispersed	Habitat importance map	0.0000
Powerful Owl	<i>Ninox strenua</i>	10248	Vulnerable	Dispersed	Habitat importance map	0.0000
Lace Monitor	<i>Varanus varius</i>	12283	Endangered	Dispersed	Habitat importance map	0.0000

Habitat group

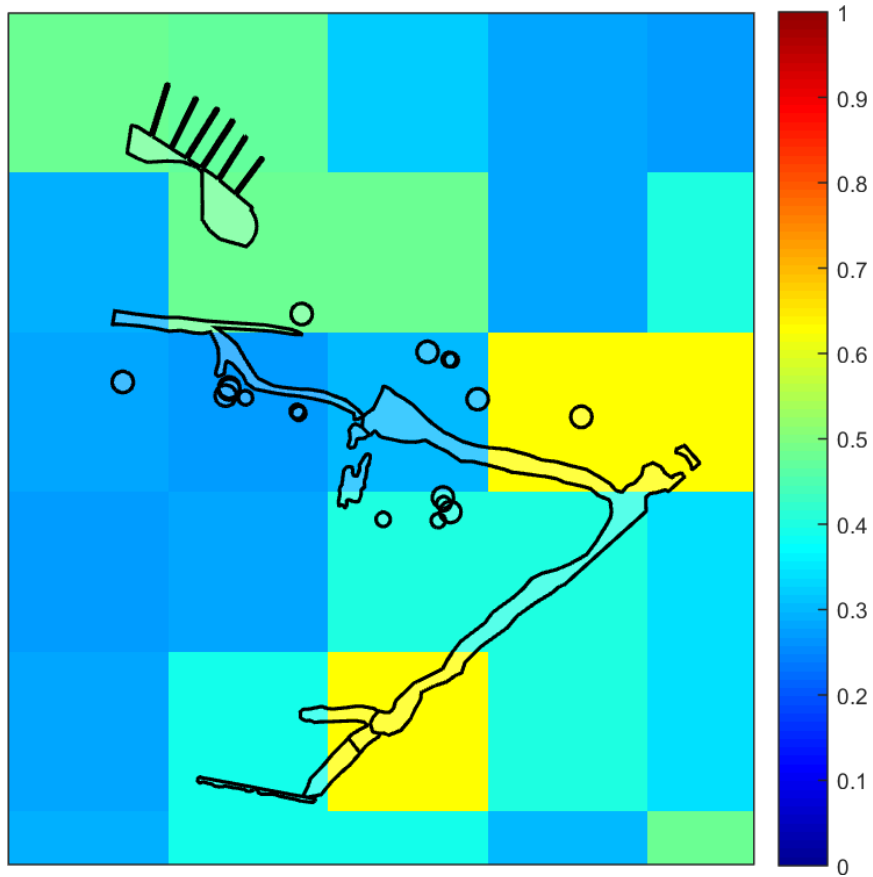
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

2. Strategic biodiversity values map



3. Aerial photograph showing mapped native vegetation



4. Map of the property in context



Yellow boundaries denote areas of proposed native vegetation removal.