Draft Report

Ecological Characterisation Report: Fingerboards Mineral Sands Project, Glenaladale, Victoria

Prepared for

Coffey Services Australia Pty Ltd

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Ecology and Heritage Partners Pty Ltd

MELBOURNE: 292 Mt Alexander Road, Ascot Vale VIC 3032 **GEELONG:** 230 Latrobe Terrace, Geelong West Vic 3218
BRISBANE: Level 22, 127 Creek Street, Brisbane QLD 4000 **ADELAIDE:** 22 Greenhill Road, Wayville SA 5034
CANBERRA: PO Box 6067, O'Connor ACT 2602 **SYDNEY:** Level 5, 616 Harris Street, Ultimo, NSW, 2007
www.ehpartners.com.au | (03) 9377 0100

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Project manager	Chad Browning (Senior Zoologist)
Report reviewer	Andrew Hill (Director/ Principal Ecologist), Aaron Organ (Director / Principal Ecologist)
Other EHP staff	Shannon LeBel (Senior Botanist), Andre Schmitz (Senior Zoologist), Lyndsey Vivian (Consultant Botanist), Brigette Hodson (Zoologist), Kelsey Tucker (Botanist), Jared McGuiness (Botanist)
Mapping	Monique Elsley (GIS Consultant), Chad Browning
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LIST OF ACRONYMS

Acronym	Description
AUSRIVAS	Australian River Assessment System
AVW	Atlas of Victorian Wildlife
CaLP Act	Victorian *Catchment and Land Protection Act 1994*
CAMBA	China Australia Migratory Bird Agreement
CMA	Catchment Management Authority
DELWP	Victorian Department of Environment, Land, Water and Planning
DoEE	Commonwealth Department of the Environment and Energy
EES	Environment Effects Statement
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESO	Environmental Significance Overlay
EVC	Ecological Vegetation Class
FFG Act	Victorian *Flora and Fauna Guarantee Act 1988*
FIS	Flora Information System
FZ1	Farming Zone
GDA	Geocentric Datum of Australia
GRGGW	Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland
JAMBA	Japan Australia Migratory Bird Agreement
LOTs	Large Old Trees
NES	National Environmental Significance
NVIM	Native Vegetation Information Management
PMST	Protected Matters Search Tool
RDZ1	Road Zone Category 1
ROKAMBA	Republic of Korea Migratory Bird Agreement
SPFL	Scientific Procedures Fieldwork Licence
VBA	Victorian Biodiversity Atlas
VPO	Vegetation Protection Overlay
WoNS	Weeds of National Significance

SUMMARY

Introduction

Ecology and Heritage Partners Pty Ltd was commissioned by Coffey Services Australia Pty Ltd, on behalf of Kalbar Resources Ltd, to undertake a Flora and Fauna Assessment for the Fingerboards Mineral Sands Project. The Fingerboards Mineral Sands Project is a proposal to develop the Glenaladale mineral sands deposit (Glenaladale deposit) in East Gippsland, Victoria.

This ecological characterisation report summarises the methods and results of ecological studies, including a detailed desktop review of biodiversity databases and literature, detailed vegetation mapping, aquatic habitat assessments, terrestrial fauna surveys and targeted searches for significant flora species. The findings presented herein support the project Environment Effects Statement (EES) and assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Methods

Desk-based and field methods were used to assess environmental conditions and identify key ecological features within the study area. The following assessments have been undertaken to date:

- Detailed desktop reviews of relevant literature, online resources and numerous databases;
- Vegetation surveys completed by two qualified Botanists over a five-day period between 6 and 10 June 2016;
- Aquatic habitat assessment completed by a qualified Aquatic Ecologist over a three-day period between 6 and 8 June 2016;
- Terrestrial fauna surveys completed by two qualified Zoologists over a five-day period between 24 and 28 October 2016 (excluding the subsequent collection of deployed remote cameras); and,
- Targeted flora surveys completed by two qualified Botanists over the course of two five-day survey events, between 24 and 28 October, and 7 and 11 November 2016.

Results

The study area is representative of many areas within the East Gippsland region with large areas of improved pastures and derived native grasslands, scattered patches of remnant vegetation and regrowth from past clearing. The majority (959 ha or 86%) of land surveyed within the study area is classified as being modified and disturbed. The remaining areas support native vegetation, which is concentrated around roadsides and the dissecting gullies. Large (up to 40 hectares) and relatively well connected remnants in these areas are complimented by smaller, fragmented patches of native vegetation and scattered trees which persist in modified areas.

Key ecological features identified within the study area and surrounding landscape are summarised in Table S1. The features recorded or predicted to occur within the study area are associated with six distinct ecological groupings, as defined Table S2.

Table S1. Key ecological features

Species diversity	• A diverse assemblage of plants and animals, with 174 flora species and 96 fauna species recorded during the field surveys.
Remnant vegetation	• 142.35 hectares of remnant vegetation represented by seven Ecological Vegetation Classes (EVCs): o Lowland Forest (2.77ha); o Lowland Herb-rich Forest (13.38ha); o Valley Grassy Forest (67.29ha); o Plains Grassy Forest (52.14ha); o Plains Grassy Woodland (11.34ha); o Aquatic Herbland (1.11ha); and, o Plains Grassy Wetland (0.18ha). • 351 native scattered trees, consisting predominately of large, old (>100 years) Eucalypt species.
Wetlands	• 1.83 hectares of land classified by the Victorian Department of Environment, Land, Water and Planning (DELWP) as a 'Current Wetland'. • The Gippsland Lakes Ramsar site, located within 20 kilometres of the study area (downstream).
Significant ecological communities	• 2.84 hectares of the nationally significant (EPBC Act-listed) Gippsland Red Gum (*Eucalyptus tereticornis subsp. mediana*) Grassy Woodland and Associated Native Grassland ecological community. • 5.11 hectares of the State significant (*Victorian Flora and Fauna Guarantee Act 1988* [FFG Act] listed) Forest Red Gum Grassy Woodland ecological community.
Significant flora species	• The known occurrence of four State significant flora species" o Slender Wire-lily *Laxmannia gracilis*; o Blue Mat-rush *Lomandra glauca s.s.*; o Slender Tick-trefoil *Desmodium varians*; and, o Sandfly Zieria *Zieria smithii* subsp. *smithii*. • The potential occurrence (moderate or high likelihood) of three nationally significant species: o Swamp Everlasting *Xerochrysum palustre*; o Dwarf Kerrawang *Commersonia prostrata*; and, o Gaping Leek-orchid *Prasophyllum correctum*. • The potential occurrence (moderate or high likelihood) of 36 State significant species within the study area.

Significant fauna species	• The known occurrence of one State significant fauna species (Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*). • The potential occurrence of five fauna species of national significance: o Swift Parrot *Lathamus discolor*; o Painted Honeyeater *Grantiella picta*; o Grey-headed Flying-fox *Pteropus poliocephalus*; o New Holland Mouse *Pseudomys novaehollandiae*; and, o Giant Burrowing Frog *Heleioporus australiacus* . • The Aquatic Habitat Assessment determined that the study area supports suitable habitat for Dwarf Galaxias; however the species is considered to have a low likelihood of occurring on site due to the lack of local records (noting a paucity of targeted survey effort). • The potential occurrence of 12 State significant species. • The known occurrence of two regionally significant fauna species (Emu *Dromaius novaehollandiae novaehollandiae*, Eastern Long-necked Turtle *Chelodina longicollis*) and the potential occurrence of an additional six regionally significant species.
Significant sites	• Four designated conservation reserves within 10 kilometres of the study area: o Mitchell River National Park; o Providence Ponds Flora and Fauna Reserve; o Fernbank Nature Conservation Reserve; and, o Saplings Morass Flora and Fauna Reserve.

Table S2. Defined ecological groupings and corresponding ecological features

Defined Group	Location	Corresponding known and potential ecological features			
		Native vegetation	Significant Species	Significant Ecological Communities	Other Features
Remnant vegetation and aquatic habitat associated with ephemeral tributary streams	The eastern and western sections of the study area, including three primary tributaries in the eastern half of the site (Perry Gully, Simpson Gully and Lucas Creek) and the unnamed tributary stream which dissects the timber plantation	• Remnant patches of Valley Grassy Forest, Lowland Herb-rich Forest and Plains Grassy Forest • Scattered trees	• Recorded significant flora species: o Slender Wire-lily o Blue Mat-rush o Slender Tick-trefoil o Sandfly Zieria • Recorded significant fauna species: o Eastern Long-necked Turtle o Yellow-bellied Sheathtail Bat • Additional significant species (plants, birds, mammals, frogs and reptiles) considered to have a moderate or higher likelihood of occurring on site	None present	• DELWP mapped 'Current Wetlands' • Habitat connectivity between ephemeral tributary streams and large areas of native bushland located north and south of the study area
Riparian and wetland habitats associated with scattered farm dams and soaks	Across the study area	• Aquatic Herbland • Plains Grassy Wetland	• Recorded significant fauna species: o Eastern Long-necked Turtle • Additional significant species (particularly frogs)	None present	• Habitat connectivity between on-site waterbodies and aquatic habitats present in the surrounding landscape • These features provide habitat for aquatic species and important water resources for terrestrial fauna

Defined Group	Location	Corresponding known and potential ecological features			
		Native vegetation	Significant Species	Significant Ecological Communities	Other Features
Roadside vegetation	Fernbank-Glenaladale Road and Bairnsdale-Dargo Road. Local roads, farm access tracks and plantation tracks are also present within the study area	• Remnant patches of Plains Grassy Woodland, Plains Grassy Forest, Lowland Forest and Lowland Herb-rich Forest • Scattered trees	• Recorded significant flora species: o Blue Mat-rush o Slender Wire-lily o Sandfly Zieria • Additional significant species (plants, birds and mammals)	• EPBC Act-listed GRGGW ecological community • FFG Act-listed Forest Red Gum Grassy Woodland ecological community	• Habitat connectivity between vegetated road reserves in the study area and large areas of native bushland located north and south of the site • BioSite: Redcourt Lane (#1682) • Planning overlays (ESO51 and VPO1)
Scattered trees	Throughout the study area, commonly occurring in farm paddocks with little or no associated indigenous vegetation, and around the tributary streams	• Scattered trees, comprising of nine different species and stags (dead trees)	• Significant fauna species considered to have a moderate or higher likelihood of occurring on site, particularly birds and mammals (microbats)	None present	• Habitat connectivity between scattered trees within the study area and bushland in the surrounding landscape

Defined Group	Location	Corresponding known and potential ecological features			
		Native vegetation	Significant Species	Significant Ecological Communities	Other Features
Timber plantations	Present within the western section of the study area, encompassing approximately 450 hectares (~30%) of the site	• Fragmented patches of Plains Grassy Woodland in harvested areas and Lowland Herb-rich Forest associated with dissecting tributary streams • Scattered trees	• Recorded significant flora species (all associated with dissecting tributary streams): o Blue Mat-rush o Slender Wire-lily o Sandfly Zieria • Recorded significant fauna species (harvested areas): o Emu o Yellow-bellied Sheathtail Bat • Additional significant species (birds, mammals)	None present	• Habitat connectivity between the native vegetation and aquatic habitats in the plantations and surrounding habitats.
Land substantially modified as a result of anthropogenic activities (largely agricultural)	Throughout the study area, with the majority (86%) of land surveyed within the study area being classified as being modified and disturbed	• Scattered, fragmented patches of remnant vegetation • Scattered trees	Scattered remnant patches and trees provide suitable habitat for significant fauna species considered to have a moderate or higher likelihood of occurrence on site. Degraded grasslands are of limited habitat value	None present	• Habitat connectivity between scattered patches and trees and surrounding habitats.

CONTENTS

1 INTRODUCTION

1.1 Background

Ecology and Heritage Partners Pty Ltd was commissioned by Coffey Services Australia Pty Ltd, on behalf of Kalbar Resources Ltd, to undertake a Flora and Fauna Assessment for the Fingerboards Mineral Sands Project. The Fingerboards Mineral Sands Project is a proposal to develop the Glenaladale mineral sands deposit (Glenaladale deposit) in East Gippsland, Victoria. Specifically, Kalbar are proposing the development of a mineral sands mine, mining unit plant, wet concentrator plant, water supply infrastructure, tailings storage facility and additional site facilities, such as a site office, warehouse, workshop, loading facilities and fuel storage. Proposed mining methods involve open pit mining to extract approximately 200 million tonnes of ore to produce 6 Mt of heavy mineral concentrate over a projected mine life of 20 years.

This ecological characterisation report summarises the methods and results of ecological studies undertaken for the project to date, including detailed vegetation mapping, aquatic habitat assessments, terrestrial fauna surveys and targeted searches for significant flora species. The findings presented herein will support the project Environment Effects Statement (EES) and assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Study Area and Surrounds

The study area (or 'site') is located approximately 22 kilometres west of Bairnsdale in East Gippsland, Victoria (37°47' S, 147°20' E). The site encompasses approximately 1,483 hectares of land within the East Gippsland Shire Council municipality and is located within a transitional zone between the Gippsland Plain (90% of the study area) and East Gippsland Lowlands bioregions. The site also extends across the management boundaries of the East and West Gippsland Catchment Management Authorities (CMAs) (Figure 1).

The key land uses within the study area include grazing (sheep and cattle), hobby farms, a disused gravel quarry, and rural residential properties. A timber plantation is present within the western section of the study area, encompassing approximately 450 hectares (~30%) of the site. The study area contains two residential dwellings, a range of agricultural infrastructure (e.g. water tanks, sheds, fences and channels) and additional built structures including a communication tower, powerlines and underground telecommunications cables. The eastern section of the study area is traversed by two main roads, namely Fernbank-Glenaladale Road and Bairnsdale-Dargo Road. Local roads, farm access tracks and plantation tracks are also present within the site.

Under the East Gippsland Planning Scheme, the predominant zoning is Farming Zone (FZ1) (99% of the site). The Bairnsdale–Dargo Road is zoned Road Zone Category 1 (RDZ1). Planning Overlays relating to ecological features within the study area include:

- An Environmental Significance Overlay (ESO51) - this overlay covers approximately 3.2 hectares of land within the Limpyers Road reserve, in the western section of the study area. The overlay aims to protect significant flora species and is applied to the local road reserve network, covering a broader area of 1,446 hectares and extending up to 11 kilometres south-east of the study area.

- A Vegetation Protection Overlay (VPO1) - this overlay covers the ESO (51) area on site and an additional 96 hectares of the study area, which is concentrated around Bairnsdale-Dargo Road and Fernbank Glenaladale Road. The overlay covers a broader area of 16,505 hectares within the municipality and aims to protect native vegetation within the Tambo-Bairnsdale road network.

The study area is located within the catchments of both the Mitchell River and Avon River. The Mitchell River passes within approximately 400 metres east of the study area, with a number of small, ephemeral tributary streams draining the eastern half of the site. The Mitchell River drains into Lake King and Jones Bay approximately 30 kilometres south-east of the study area, forming part of the Ramsar-listed Gippsland Lakes system. The Victorian Department of Environment, Land, Water and Planning (DELWP) Biodiversity Interactive Map (DELWP 2017a) identifies the three primary tributaries in the eastern half of the study area as Perry Gully, Simpson Gully and Lucas Creek (Figure 2). Minor waterways in the western section of the study area drain into Honeysuckle Creek, a tributary of Perry River located approximately 2.2 kilometres south of the site. Perry River discharges into Lake Wellington and the Gippsland Lakes Ramsar site approximately 25 kilometres south of the study area. The Aquatic Habitat Assessment (Aquatica Environmental 2016) determined that permanent water within the study area is limited to pooled areas within tributary streams in the eastern and western sections of the site, and scattered farm dams.

In addition to the waterbodies noted above, the tributary stream which dissects the timber plantation in the western section of the study area is classified as a 'Current Wetland' by DELWP. Under the '*Permitted clearing of native vegetation - Biodiversity assessment guidelines*' (the Guidelines) (DEPI 2013), these areas are classified as native vegetation and must be accounted for when applying for a permit to remove, destroy or lop native vegetation and calculating offset obligations (Figure 3; Section 3.1.3).

The topography of the study area is flat to gently undulating with sharply rising river terraces, eroded gullies and surface water forms scattered throughout the landscape. The site is located within the eastern lowlands region of the Gippsland Lakes Basin, which consists of fans, terraces and floodplains. The Haunted Hills Gravels outcrop extensively across the study area. Overlying soils are sodic and affected by gully and tunnel erosion in areas of steeper gradient. Underlying the Haunted Hill Formations are the fine sands of the Coongulmerang Formation which host the Glenaladale mineral sands deposit. Soils within the study area are characterised by pale sands and duplex soils (brown kurosols and sodosols) with low compaction and high leaching.

Remnant patches of native vegetation within the surveyed sections of the study area are concentrated around the ephemeral tributary streams and the reserves of main and local roads. A diversity of vegetation types is present within these areas, supporting dry forest, lowland forest, plains woodland and wetlands. An abundance of scattered native trees also occur across the site. Recent vegetation surveys identified that the majority of assessed land supported disturbed pasture, dominated by non-native flora species common to agricultural environments. The plantation located in the western section of the site supports a monoculture of Eucalypt and Pine species; with remnant native vegetation in this area limited to patches of lowland forest along the dissecting tributary. Harvested areas support scattered, fragmented patches of Plains Grassy Woodland.

The temperate oceanic climate is characteristic of East Gippsland. Climate statistics for Bairnsdale show a warm summer period with January and February sharing a monthly mean maximum temperature of 25.3° (Bureau of Meteorology 2016). This compares with the coldest monthly mean maximum temperature of August at 4.4°C.

Overnight temperatures during winter are occasionally below 0°C. Mean annual rainfall is 650 millimetres (recorded at Bairnsdale Airport) with a strong tendency for winter and spring months being wetter (Bureau of Meteorology 2016). Long heat wave periods without rainfall can cause high fire danger periods over summer and autumn. In early February 2014, the Glenaladale-Mt Ray bushfire burnt approximately 1,100 hectares (~75%) of the study area (DELWP 2017a) (Figure 1). The fire was started by a lightning strike and burned for approximately three weeks, razing approximately 6,738 hectares of land within the broader locality.

2 METHODS

This chapter details the desk-based and field methods used in surveying the current environment as well as the methods used to assess the likelihood of significant flora and fauna species occurring within the study area.

2.1 Desktop Assessment

Relevant literature, online-resources and databases were reviewed to provide an assessment of flora and fauna features associated with the study area. The following information sources were reviewed:

- The DELWP Native Vegetation Information Management (NVIM) Tool (DELWP 2017b) and Biodiversity Interactive Map (DELWP 2017a) for:
  - Modelled data for location risk, remnant vegetation patches, scattered trees and habitat for rare or threatened species; and,
  - The extent of historic and current Ecological Vegetation Classes (EVCs).
- EVC benchmarks (DELWP 2017c) for descriptions of EVCs within the Gippsland Plain and East Gippsland Lowlands bioregions;
- The Victorian Biodiversity Atlas (VBA) for previously documented flora and fauna records within 10 kilometres of the study area (DELWP 2016a);
- The Flora Information System (FIS) (Viridans 2014a) and Atlas of Victorian Wildlife (AVW) (Viridans 2014b) for assistance with the distribution and identification of flora and fauna species;
- The Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) for matters of National Environmental Significance (NES) protected under EPBC Act (DoEE 2017a);
- Relevant listings under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), including the latest Threatened and Protected listings (DELWP 2017d; DELWP 2015);
- The Planning Maps Online (DELWP 2017e) and Planning Schemes Online (DELWP 2017f) to ascertain current zoning and environmental overlays in the study area;
- Aerial photography of the study area;
- Previous ecological or other relevant assessments of the study area, including the Environmental Baseline Report (Coffey Environments Australia Pty Ltd 2015); and,
- Documents prepared by East Gippsland Shire Council and the subject CMAs relating to the management of environmental features within the municipality and catchments, including:
  - *East Gippsland Roadside Vegetation Strategy* (East Gippsland Shire Council 2012)
  - *East Gippsland Forest Management Plan* (East Gippsland Shire Council 1995)
  - *East Gippsland Regional Catchment Strategy 2013-2019* (East Gippsland CMA 2013)
  - *West Gippsland Native Vegetation Plan 2003* (West Gippsland CMA 2003)
  - *West Gippsland Regional Catchment Strategy 2013-2019* (West Gippsland CMA 2012).

2.2 Field Assessment

Field surveys for the project were undertaken on five separate occasions:

- Vegetation surveys completed by two qualified Botanists over a five day period between 6 and 10 June 2016;
- Aquatic habitat assessment completed by a qualified Aquatic Ecologist over a three day period between 6 and 8 June 2016;
- Terrestrial fauna surveys completed by two qualified Zoologists over a five day period between 24 and 28 October 2016 (excluding the subsequent collection of deployed remote cameras); and,
- Targeted flora surveys completed by two qualified Botanists over the course of two five-day events, between 24 and 28 October and 7 and 11 November 2016.

The above noted surveys were undertaken across 1,109 hectares (75%) of the study area, including all areas of public land (road reserves), Kalbar owned land and private property where landowners had granted permission to access (Figure 2). The surveys sought primarily to assess the extent and condition of native vegetation communities and potential flora and fauna habitat, with particular consideration given to significant ecological communities and species of conservation concern, such as threatened and migratory species.

All fieldwork was carried out under the appropriate licences, including a Research Permit (10006893) and Scientific Procedures Fieldwork Licence (SPFL 410) issued by DELWP under the *Wildlife Act 1975,* and an Animal Research permit issued by the Wildlife and Small Institutions Animal Ethics Committee (22.13).

Survey effort is described below and mapped in Figure 2. Appendix 3.1 details the weather conditions during each field survey event.

2.2.1 Flora Survey Methods

Flora assessments were undertaken within the study area during early winter and spring 2016. A total of 30 person days (excluding travel) were spent in the study area, with survey effort often in excess of 10 hours per day. Over the study there were in excess of 300 hours in total spent surveying native vegetation, ecological communities and significant flora species.

2.2.1.1 General Flora and Vegetation Assessments

During field assessments the survey area was assessed by foot and/or vehicle, with all observed vascular flora species recorded, any significant records mapped and the overall condition of vegetation and habitats noted. Ecological Vegetation Classes were determined with reference to DELWP pre-1750 and extant EVC mapping and their published descriptions (DELWP 2017c). Where remnant vegetation was identified, a habitat hectare assessment was undertaken following the methodology described in the Vegetation Quality Assessment Manual (DSE 2004). Native vegetation was classified in accordance with the definitions provided in Table 1, sourced from the Guidelines (DEPI 2013).

Table 1. Determination of remnant native vegetation (DEPI 2013)

Category	Definition
Remnant patch of native vegetation	An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native. OR An area with three or more native canopy trees where the canopy foliage cover is at least 20 per cent of the area.
Scattered tree	A native canopy tree that does not form part of a remnant patch.

Note: Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'.

In addition, the type and general condition of all vegetation was assessed and a determination made as to whether it qualifies for further consideration under local, State or national legislation and policy.

2.2.1.2 Targeted Flora Surveys

Targeted surveys were undertaken over two separate five-day survey events in spring 2016, focussing on flora species identified as having the potential to occur within the study area, and being detectable in spring (Appendix 1.2). The targeted surveys were undertaken by a team of two Botanists and involved traversing all areas of remnant vegetation recorded within the survey area at five metre intervals. Handheld GPS units were used to record the location of any significant species encountered.

2.2.2 Fauna Survey Methods

Terrestrial and aquatic fauna assessments were undertaken within the study area during early winter and spring 2016. A total of 14 person days (excluding travel) were spent in the study area, with survey effort often in excess of 10 hours per day. Over the study there were in excess of 140 hours in total spent surveying for aquatic and terrestrial fauna species within the survey area (excluding Anabat and remote camera survey nights). In addition to collecting baseline information, the surveys targeted significant fauna species previously recorded or considered likely to occur within 10 kilometres of the study area, such as Growling Grass Frog *Litoria raniformis*.

The following sections summarise the fauna survey effort completed to date.

2.2.2.1 Aquatic Habitat Assessment

The assessment was completed by a qualified Aquatic Ecologist over three days in early winter 2016 (6 - 8 June) and involved the following three tasks (Aquatica Environmental 2016).

Desktop Review

In order to gain an understanding of the aquatic features within the study area, a desktop review was completed, encompassing all land within 10 kilometres of the study area. The information sources reviewed are detailed in Section 2.1.

Survey Site Selection

The tributary streams and gullies in the study area were initially identified at a desktop level. Where access was permitted, the creek lines and gullies were walked by an Aquatic Ecologist to undertake the assessment and identify whether there was suitable aquatic habitat to establish a survey site.

At the time of the survey most of the tributaries and gullies were dry or with no or negligible baseline flow (i.e. any observed flow was more likely temporary and related to recent rains).

Aquatic Habitat and Waterway Condition Assessment

Where possible, survey sites were established approximately every 500 metres along each of the tributary streams in the survey area, with 33 sites sampled over the three-day survey period (Table 2; Figure 2).

Table 2. Aquatic Habitat Assessment sites

Site	Coordinates [1]	Description	Site	Coordinates	Description
1	E530134, N5817440	Perry Gully	18	E533556, N5816900	Lucas Creek
2	E529920, N5817355	Perry Gully	19	E533807, N5817360	Lucas Creek
3	E529909, N5817315	Perry Gully	20	E529721, N5818303	Tributary of Moilun Creek
4	E529557, N5817342	Perry Gully	21	E529456, N5818123	Tributary of Moilun Creek
5	E529165, N5817147	Dam on Perry Gully	22	E529278, N5818013	Dam on tributary of Moilun Creek
6	E530367, N5816609	Simpson Gully	23	E526855, N5815884	Dam on tributary of Honeysuckle Creek
7	E530723, N5816584	Dam on Simpson Gully	24	E527129, N5815989	Tributary of Honeysuckle Creek
8	E531171, N5816819	Simpson Gully	25	E527511, N5816013	Dam on tributary of Honeysuckle Creek
9	E531722, N5817860	Unnamed gully	26	E527274, N5816971	Dam on tributary of Long Marsh Gully
10	E531717, N5818430	Perry Gully discharge to Mitchell River	27	E527993, N5817289	Tributary of Moilun Creek
11	E531553, N5818202	Perry Gully	28	E525628, N5814108	Tributary of Honeysuckle Creek
12	E531255, N5818141	Perry Gully	29	E525515, N5814696	Tributary of Honeysuckle Creek
13	E532162, N5817311	Simpson Gully	30	E525839, N5815445	Dam on tributary of Honeysuckle Creek
14	E532421, N5815854	Lucas Creek	31	E526122, N5815963	Dam on tributary of Honeysuckle Creek
15	E533061, N5815918	Lucas Creek	32	E526041, N5816560	Dam on tributary of Honeysuckle Creek
16	E533600, N5815686	Lucas Creek tributary	33	E526233, N5816533	Dam on tributary of Honeysuckle Creek
17	E533558, N5816350	Lucas Creek			

Notes: 1) GDA94, MGA55

At sites where aquatic habitat was identified and/or where there was the potential for the site to support aquatic biota an assessment of the aquatic habitat and waterway condition was undertaken. The habitat assessment was undertaken using the assessment and data collection protocols outlined in the Victorian Australian River Assessment System (AUSRIVAS) (eWater 2016).

At each selected survey site, where aquatic habitat was present, the following habitat and stream condition parameters were assessed and recorded:

- GPS coordinates and a site reference photograph;
- Waterbody width (minimum, maximum and mean over selected reach) and estimated depth;
- Flow type (pool, riffle, run, none, etc.);
- Type and percentage cover of aquatic vegetation (fringing, emergent, floating, submerged, etc.);
- Percentage cover of in stream coarse and fine debris (e.g. logs, branches, leaves, twigs);
- Percentage cover of undercut or overhanging bank;
- Riparian vegetation condition (e.g. pasture, woodland, grassland, weeds);
- Percentage of in stream shading at noon;
- Substrate composition (e.g. clay, silt, pebble, gravel, rock, bedrock, etc.);
- Connectivity (spatial and temporal, including flow regime);
- Potential barriers to fish passage; and,
- Signs of disturbance (e.g. bare bank, litter, livestock access, erosion, evidence of nutrients).

Where there was sufficient water and/or aquatic habitat, in situ water quality was measured using a calibrated TPS 90FLT multi-parameter water quality meter for the following parameters:

- Dissolved oxygen (% and PPM);
- Electrical conductivity (µS/cm);
- pH;
- Temperature; and,
- Turbidity (NTU).

As part of this assessment the quality of any observed aquatic habitat was assessed in accordance with the following rankings:

- Aquatic habitat/ water absent;
- Minimal aquatic habitat: Likely highly ephemeral and dry during lower rainfall periods and unlikely to support aquatic fauna;
- Moderate quality aquatic habitat: Permanent water/refuge present but limited connectivity to other aquatic habitat or mostly ephemeral but potential for some permanent water/refuge areas (i.e. pools) and potential to support aquatic fauna; and,
- Good quality aquatic habitat: Permanent water/refuge present, connectivity to other good aquatic habitat and either likely to, or does support aquatic fauna.

Results of the Aquatic Habitat Assessment are presented in Appendices 3.3 and 3.4.

2.2.2.2 *Terrestrial Fauna Surveys*

Surveys for terrestrial fauna were undertaken in spring 2016 and comprised fauna habitat assessments, diurnal bird and herpetofauna surveys, spotlighting, stagwatching, call playback surveys, Anabat surveys and remote camera surveys (Table 3). In addition, opportunistic sightings of animals and indirect evidence of faunal activity, such as scats, diggings, scratch marks, etc., was also investigated and recorded.

The majority of surveys focussed on 13 primary survey sites, representative of five fauna stratifications (Table 4; Figure 2). Remote cameras were sited to provide a good coverage across the study area and representation of the fauna stratifications present (Table 5; Figure 2).

Nocturnal frog call census surveys and targeted Growling Grass Frog surveys were undertaken at the three locations identified by the Aquatic Habitat Assessment as supporting good quality habitat (Sites 23, 24 and 25) (Table 2; Figure 2).

Table 3. Terrestrial fauna survey techniques and total survey effort within the study area.

Survey technique	Significant species or groups targeted, or with potential to be detected using the technique	# Sites	Total survey effort
Habitat assessments and incidental observations of fauna	N/A	Entire survey area, with detailed assessments completed at each primary survey site (13 sites surveyed)	Duration of the survey period i.e. 14 person days
Diurnal bird surveys	Potential: Significant bird species listed in Table 2.2, Appendix 2	Each primary survey site, excluding those representative of disturbed pasture and within the plantation (Site A1-A4) (9 sites surveyed)	3 x 30 minute surveys completed at each assessed primary survey site
Herpetofauna surveys	Potential: Significant reptile species listed in Table 2.2, Appendix 2	Each primary survey site, excluding those representative of disturbed pasture and within the plantation (Site A1-A4) (9 sites surveyed)	3 x 30 minute surveys completed at each assessed primary survey site
Spotlighting	Potential: Significant bird, mammal, reptile and amphibian species listed in Table 2.2, Appendix 2	The area surrounding each primary survey site (13), and along the two main roads within the study area	Five nights of spotlighting (including the night following camera collection) across the study area, with each primary survey site surveyed for at least 30 minutes (two observers)
Nocturnal call playback	Targeted: Australasian Bittern *Botaurus poiciloptilus*, Growling Grass Frog, Powerful Owl *Ninox strenua*, Sooty Owl *Tyto tenebricosa tenebricosa*, Masked Owl *Tyto novaehollandiae novaehollandiae*	Each primary survey site (13 sites surveyed)	One call playback event completed at each primary survey site

Survey technique	Significant species or groups targeted, or with potential to be detected using the technique	# Sites	Total survey effort
AnaBat recording (insectivorous bats)	Potential: Significant microbat species	Each primary survey site, excluding those representative of disturbed pasture and within the plantation (Site A1-A4) (9 sites surveyed)	One Anabat unit deployed at each surveyed primary survey site for four nights (36 detector nights)
Remote camera surveys	Potential: Significant mammal species listed in Table 2.2, Appendix 2	Each primary survey site, excluding those representative of disturbed pasture and within the plantation (Site A1-A4), and an additional 16 sites across the study area (25 sites surveyed)	25 remote cameras deployed for at least 15 nights
Nocturnal frog call census surveys and targeted Growling Grass Frog surveys	Targeted: Significant frog species listed in Table 2.2, Appendix 2	Sites 23, 24 and 25 (Aquatica Environmental 2016)	Three nocturnal survey events at each site, including active searching, call-playback and spotlighting

Table 4. Primary survey sites - terrestrial fauna survey

Site	Coordinates [1]	Fauna Stratification (and represented EVCs)
LF1	E526133, N5816028	Lowland Forest (Lowland Herb-rich Forest - EVC 877, Lowland Forest - EVC 16)
LF2	E533456, N5815426	
DF1	E531677, N5817155	Dry Forest (Valley Grassy Forest - EVC 47)
DF2	E530138, N5817459	
DF3	E532472, N5815905	
PW1	E529016, N5817928	Plains Woodland (Plains Grassy Forest - EVC 151, Plains Grassy Woodland - EVC 55)
PW2	E527666, N5816547	
PW3	E530807, N5817938	
W1	E530924, N5816559	Wetland (Aquatic Herbland - EVC 653, Plains Grassy Wetland - EVC 125)
A1	E533071, N 5815525	Modified land (disturbed pasture)
A2	E528370, N5816789	Modified land (cleared Eucalypt plantation)
A3	E527378, N5816966	Modified land (Eucalypt plantation)
A4	E526577, N5815974	Modified land (pine plantation)

Notes: 1) GDA94, MGA55

Table 5. Remote camera survey sites - terrestrial fauna survey

Site	Coordinates [1]	Fauna Stratification	Site	Coordinates	Fauna Stratification
C01	E526012, N5816541	Lowland Forest	C14	E530462, N5817345	Dry Forest
C02	E526110, N5816032	Lowland Forest	C15	E530043, N5816381	Plains Woodland
C03	E525814, N5815444	Lowland Forest	C16	E530957, N5816543	Wetland
C04	E526731, N5815845	Lowland Forest	C17	E531637, N5817720	Dry Forest
C05	E527339, N5816826	Plains Woodland	C18	E531691, N5817129	Dry Forest
C06	E527667, N5816547	Plains Woodland	C19	E532004, N5817422	Plains Woodland
C07	E528717, N5816671	Disturbed Pasture	C20	E532175, N5817294	Dry Forest
C08	E529088, N5817086	Plains Woodland	C21	E533021, N5816380	Plains Woodland
C09	E528907, N5817868	Plains Woodland	C22	E532483, N5815888	Dry Forest
C10	E529526, N5817899	Plains Woodland	C23	E533000, N5815987	Dry Forest
C11	E529845, N5817951	Plains Woodland	C24	E533504, N5816321	Plains Woodland
C12	E530742, N5818000	Plains Woodland	C25	E533463, N5815395	Lowland Forest
C13	E530139, N5817459	Dry Forest			

Notes: 1) GDA94, MGA55

2.3 Likelihood of Occurrence Assessment

Relevant biological databases, literature (listed in Section 2.1) and expert advice were used to identify all species records of national, State and regional conservation significance within 10 kilometres of the study area. The proximity, number, dispersion and date of known locality records (assuming over-dispersed and random patterns of locality records being more likely to occur in the study area) were considered to determine a species' likelihood of occurrence within the study area.

Additional factors also taken into consideration include: the known biogeographical distribution of the species; underlying geology of existing locality records; and, vegetation and habitat associations. The decision guidelines for determining the likelihood of occurrence of flora and fauna species are presented in Table 6 and Table 7, respectively.

The results of the likelihood of occurrence assessment for significant flora and fauna species are provided in Appendices 1.2 and 2.2, respectively.

Table 6. Decision guidelines for determining a flora species likelihood of occurrence within the study area.

Likelihood of occurrence	Decision guidelines
1 – Known occurrence	Recorded within the study area recently (i.e. within ten years).
2 - High	Previous records of the species in the local vicinity; and/or, the study area contains areas of high quality habitat.
3 – Moderate	Limited previous records of the species in the local vicinity; and/or, the study area contains some characteristics of the species' preferred habitat.
4 – Low	Poor or limited habitat for the species however other evidence (such as a lack of records or environmental factors) indicates there is a low likelihood of presence.
5 – Unlikely	No suitable habitat and/or outside the species range.

Table 7. Decision guidelines for determining fauna species likelihood of occurrence within the study area.

Likely presence or use of the study area	Decision guidelines
1 – Known occurrence	Recorded within the study area recently (i.e. within ten years).
2 - High	Likely resident in the study area based on database records, or expert advice; and/or, recent records (i.e. within ten years) of the species in the local area; and/or, the study area contains the species' preferred habitat.
3 - Moderate	The species is likely to visit the study area regularly (i.e. at least seasonally); and/or, previous records of the species in the local area; and/or, the study area contains some characteristics of the species' preferred habitat.
4 - Low	The species may visit the study area occasionally or opportunistically whilst en route to more suitable sites; and/or, there are only limited or historical records of the species in the local area (i.e. more than 20 years old); and/or, the study area contains few or no characteristics of the species' preferred habitat.
5 - Unlikely	No previous records of the species in the local area; and/or, the species may fly over the study area when moving between areas of more suitable habitat; and/or, out of the species' range; and/or, no suitable habitat present.

2.4 Assessment Qualifications and Limitations

The entire study area was assessed with the exception of areas where permission for access was not granted by the landowners. Parcels where access was not permitted are illustrated in Figure 2. Where possible, the ecological features in these parcels were assessed from the roadside and/or adjacent private properties. However, in larger properties the vegetation and fauna habitat remain unsighted.

2.4.1 Vegetation and Flora Surveys

Data and information held within the ecological databases and mapping programs reviewed in the desktop assessment (e.g. VBA, PMST, Biodiversity Interactive Maps etc.) are unlikely to represent all flora and fauna observations within, and surrounding, the study area. It is therefore important to acknowledge that a lack of documented records does not necessarily indicate that a species or community is absent.

The size of the study area meant that the vegetation mapping was completed "to scale", meaning that smaller variations in vegetation extent may not be shown. Ecological features identified on site were recorded using a hand-held GPS or tablet with an accuracy of +/-5 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological features present within the study area.

Flora surveys were undertaken during the optimal flowering period for the majority of targeted species to maximise the probability of detecting each species. Given that all areas of suitable habitat for significant flora species were extensively surveyed (five metre transects), it is considered that sufficient effort has been employed to determine the likelihood of each target species occurring onsite. Given the cryptic nature of a number of species targeted, disturbance associated with the relatively recent bushfire event and the general limitations of targeted surveys, the precautionary principle has been applied when determining the likelihood of occurrence.

2.4.2 Terrestrial and Aquatic Fauna Surveys

Detailed terrestrial and aquatic fauna assessments were undertaken throughout the majority (75%) of the study area, within areas where access was permitted. The assessments included desktop investigations together with extensive field assessments. The survey effort and outcomes are considered appropriate in characterising faunal features that occur on-site. Where possible, surveys to maximise the detection of significant fauna species were undertaken.

Targeted Growling Grass Frog surveys were completed at the three highest quality sites identified by the Aquatic Habitat Assessment (Aquatica Environmental 2016). Sites representative of lower quality habitats were not extensively surveyed; however based on the habitat assessments completed; the species is considered to have a low likelihood of occurring within these areas.

Overall it is considered that the terrestrial and aquatic fauna data collected during the field assessment, habitat assessments, and information obtained from relevant sources (e.g. biological databases and relevant literature) provides an accurate assessment of the fauna species and habitat features within the study area.

3 EXISTING ENVIRONMENT

The following description of the existing environment is based on the landscape, vegetation, fauna habitats and species identified from the desktop assessment and within the study area during the field surveys.

3.1 The Ecology and Biodiversity of the Study Area

3.1.1 Overview

The majority of the study area is highly modified due to agricultural practices and is dominated by pasture supporting non-indigenous grasses and weeds. Much of the indigenous vegetation and good quality terrestrial fauna habitat remaining within the study area is confined to roadsides and the dissecting gullies, which have been less affected by past land clearing and sustained agricultural land use. The large (up to 40 hectares) and relatively well connected remnants in these areas are complimented by smaller, fragmented patches of native vegetation and scattered trees which persist in modified areas (Figure 3).

Gullies in the eastern half of the study area are typically dominated by the Plains Grassy Forest and Valley Grassy Forest vegetation types, whilst the tributary streams in the western section of the site are fringed by Lowland Herb-rich Forest. The reserves of Bairnsdale-Dargo Road and Fernbank- Glenaladale Road support linear, contiguous patches of Plains Grassy Woodland and Plains Grassy Forest. Aquatic Herbland and Plains Grassy Wetland vegetation occurs around farm dams and pools along the tributary streams. Lowland forest is confined to the southern sections of the study area, occurring within the Fernbank-Glenaladale Road reserve and on private property in the south-east corner of the study area. Scattered remnant trees are prevalent throughout the study area, commonly occurring in farm paddocks with little or no associated indigenous vegetation, and around the tributary streams. These trees consist mainly of large, old (>100 years) Gippsland Red Gums *Eucalyptus tereticornis* subsp. *mediana*, Red Box *Eucalyptus polyanthemos* and White Stringybarks *Eucalyptus globoidea,* with a few examples of other locally common Eucalypt species present (Appendix 1.4).

The study area supports a mosaic of fauna habitat types, including lowland forest, dry forest, plains woodland, wetlands, scattered trees, disturbed pasture and plantation. Each of these habitat types are unique in their habitat provisions and subsequently support a unique suite of fauna species (Appendices 2.1 and 3.2).

3.1.2 Species

3.1.2.1 Flora

The field surveys identified 174 flora species from 57 families within the study area, of which 128 (approximately 74%) were native (Appendix 1.1). The most species rich families included the Poaceae (30 species), Asteraceae (26) and Fabaceae (15).

Eight species recorded in the study area are declared noxious weeds listed under the Victorian *Catchment and Land Protection Act 1994* (CaLP Act) (Table 8). Blackberry *Rubus fruticosus L. agg.*, African Box-thorn *Lycium ferocissimum* and Bridal Creeper *Asparagus asparagoides* are of particular importance as they are Weeds of National Significance (WoNS) under national management as part of the National Weeds Strategy (Natural Resource Management Ministerial Council 2006).

Table 8. Noxious weeds recorded within the study area

Species Name	Common Name	Category[1]	WoNS[2]
Rubus fruticosus L. agg.	Blackberry	Regionally Controlled Weed	**Yes**
Cirsium vulgare	Spear Thistle		No
Juncus acutus	Spiny rush		No
Carthamus lanatus	Saffron Thistle		No
Cirsium arvense	Perennial Thistle		No
Solanum linnaeanum	Apple of Sodom		No
Lycium ferocissimum	African Box-thorn		**Yes**
Asparagus asparagoides	Bridal Creeper	Restricted Weed	**Yes**

Note: 1) Regionally Controlled Weed and Restricted Weed under the CaLP Act
2) WoNS under national management

3.1.2.2 Fauna

Field surveys of the study area recorded 96 species of fauna including 88 native species and eight introduced species (Appendix 2.1). A broad range of bird species were detected, including woodland and wetland birds, along with those tolerant of open and/or modified landscapes. A high diversity of mammals was detected, including microbats, arboreal and small ground-dwelling mammals and macropods. Several reptiles (skinks, lizards and turtles) were found in woodland and wetland habitats. Common frog species were detected from within tributary streams, dams and soaks across the study area (Table 9).

Table 9. Summary of fauna species identified within the study area

Fauna Guild	Species Richness	
	Native	Introduced
Birds	59	3
Mammals (non-bats)	6	5
Mammals (bats)	8	-
Frogs	8	-
Reptiles	7	-
Total	**88**	**8**

Three of the 96 fauna species recorded within the study area are declared pests under the Victorian CaLP Act, namely European Hare *Lepus europaeus*, European Rabbit *Oryctolagus cuniculus* and Red Fox *Vulpes vulpes.* These species are classified as Established Pest Animals, which indicates they pose a serious threat to primary production, Crown Land, the environment or community health in Victoria.

Detailed results of the Anabat and remote camera surveys are provided in Appendices 3.5 and 3.6, respectively.

3.1.3 Vegetation

Modelling undertaken by DELWP provides an indication of the likely extent and type of native vegetation (remnant patches) present within the study area prior to European settlement and in 2005 (Table 10). The modelling suggests that only 22% of native vegetation has been retained within the study area since 1750, with small fragmented patches predicted to occur across the site and larger contiguous remnants mapped along the gullies and main road reserves.

Vegetation mapping completed as part of this assessment largely confirms the modelled paucity of native vegetation within the study area. Detailed vegetation mapping completed across 1,109 hectares (75%) of the study area recorded 142.35 hectares of remnant vegetation (excluding mapped 'Current Wetlands') and 351 scattered trees (Table 10 and Table 11; Figure 3).

Remnant native vegetation identified in the study area during the field survey is representative of seven EVCs: Lowland Forest (EVC 16), Lowland Herb-rich Forest (EVC 877), Valley Grassy Forest (EVC 47), Plains Grassy Forest (EVC 151), Plains Grassy Woodland (EVC 55), Aquatic Herbland (EVC 653) and Plains Grassy Wetland (EVC 125). The presence of these EVCs is generally consistent with the modelled pre-1750s native vegetation mapping (DELWP 2017c).

In addition to the remnant patches, a section of the tributary stream which dissects the plantation in the western section of the study area is classified as a 'Current Wetland' by DELWP (Figure 3). Under the Guidelines (DEPI 2013), these areas are classified as native vegetation and must be accounted for when applying for a permit to remove, destroy or lop native vegetation and calculating offset obligations (Figure 3; Section 3.1.3). The mapped extent of Current Wetlands may be refined if supported by the outcome of a hydrological assessment and approved by DELWP.

The remainder of the study area comprises introduced and planted vegetation, present as pasture, windrows and timber plantations. Much of the vegetation in the study area exhibited evidence of a relatively recent (2014) bushfire, with dead trees, charcoal, and regrowth observable. Specific details relating to observed EVCs are provided below.

Table 10. Modelled and confirmed EVC extents within the study area

EVC	Modelled Extent (ha)		Field Survey (ha)
	Pre-1750	2005	
Lowland Forest (EVC 16)	27.44	0.58	2.14 (Habitat Score - Range 0.29-0.49)
Valley Grassy Forest (EVC 47)	63.49	14.40	64.75 (0.15 - 0.50)
Plains Grassy Woodland (EVC 55)	500.54	93.03	12.31 (0.20 - 0.57)
Plains Grassy Wetland (EVC 125)	-	-	0.18 (0.32 - 0.52)
Plains Grassy Forest (EVC 151)	696.7	193.57	48.80 (0.2 - 0.58)
Aquatic Herbland (EVC 653)	-	-	0.79 (0.29 - 0.45)
Lowland Herb-rich Forest (EVC 877)	115.01	10.31	13.38 (0.21 - 0.61)
Lowland Forest/Damp Sands Herb-rich Woodland Mosaic (EVC 795)	79.59	13.36	-
DELWP Mapped 'Current Wetland'	-	-	1.83
Total	**1,482.77**	**325.25**	**144.18**

Table 11. Summary of scattered trees within the study area

Species	Number
Gippsland Red-Gum *Eucalyptus tereticornis subsp. mediana*	116
Red Box *Eucalyptus polyanthemos*	122
White Stringybark *Eucalyptus globoidea*	41
Stag	46
Red Stringybark *Eucalyptus macrorhyncha*	11
Blue Box *Eucalyptus baueriana*	5
Yellow Stringybark *Eucalyptus muelleriana*	5
Red Ironbark *Eucalyptus tricarpa*	2
Messmate *Eucalypt obliqua*	2
Drooping Sheoak *Allocasuarina littoralis*	1
Total	**351**

Lowland Forest

Lowland Forest is typically characterised by a 20 metre tall Eucalypt forest on fertile, well drained soils in areas of high rainfall. The understorey is diverse and includes a wide range of shrubs, grasses and herbs (DELWP 2017b).

Within the study area, Lowland Forest was predominantly recorded along road reserves close to the 'Fingerboards' intersection (Figure 3; Plates 1 and 2).

The overstorey was dominated by Messmate *Eucalypt obliqua*, but also comprised scattered occurrences of Narrow-leaf Peppermint *Eucalyptus radiata*. The understorey supported a wide variety of species and life-forms including the shrubs Prickly Tea-tree *Leptospermum continentale*, Heath Tea-tree *Leptospermum myrsinoides*, and Burgan *Kunzea ericoides*, with the graminoids, ferns and herbs Austral Bracken *Pteridium esculentum*, Thatch Saw-sedge *Gahnia radula*, Wattle Mat-rush *Lomandra filiformis*, Variable Sword Sedge *Lepidosperma laterale*, Veined Spear-grass *Austrostipa rudis* subsp. *rudis* and Forest Wire-grass *Tetrarrhena juncea* common throughout.

A total of three habitat zones of differing quality were recorded (LF1 – LF3) in the middle and eastern sections of the study area, with the differences in quality predominantly due to the diversity of the understorey and extent of weed cover (Appendix 1.3). Zone LF1 is a high quality remnant located in the south-east corner of the study area, supporting an intact overstorey and an understorey component with a diverse range of species and life form structures present. The remaining habitat zones are of lower quality and contain modified understorey components to varying degrees with a high proportion of exotic species present in the understorey, likely due to the ongoing disturbance associated with being located in a road reserve, and from adjacent agricultural activities.

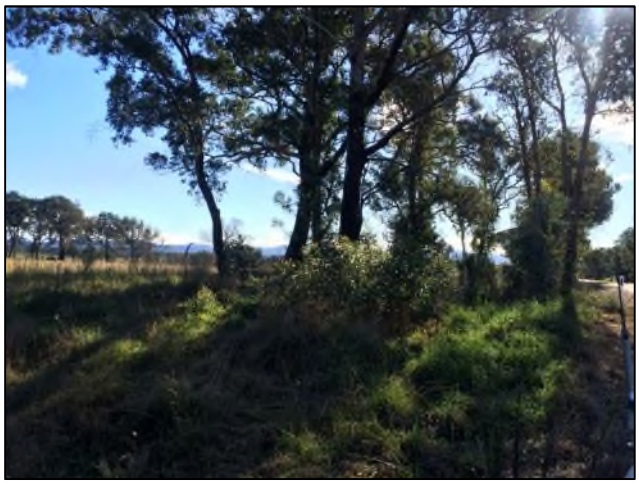

Plate 1. Lowland Forest within the study area (Ecology and Heritage Partners Pty Ltd 08/06/2016).

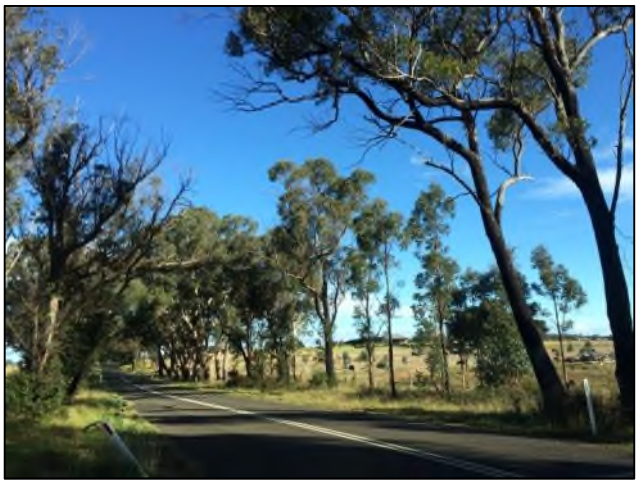

Plate 2. Lowland Forest within the study area (Ecology and Heritage Partners Pty Ltd 08/06/2016).

Lowland Herb-rich Forest

Lowland Herb-rich Forest typically contains an open Eucalypt forest to 20 metres tall with a range of shrubs present in the understorey. The ground layer comprises a diverse range of grasses, graminoids and herbs on fertile soils, and is predominantly situated in gullies and lower slopes of minor drainage lines (DELWP 2017b).

Within the study area, Lowland Herb-rich Forest was predominantly recorded to the west, in gullies and the lower slopes adjacent to the timber plantations (Figure 3; Plates 3 and 4).

The overstorey component of the EVC contained Mountain Grey-gum *Eucalyptus cypellocarpa* and White Stringybark, with the shrub layer dominated by Burgan, Black Wattle *Acacia mearnsii* and Prickly Tea-tree.

The ground-layer contained the graminoids Spiny-headed Mat-rush *Lomandra longifolia*, Weeping Grass *Microlaena stipoides* var. *stipoides* and Thatch Saw-sedge, as well as a high cover of herbs including Kidney Weed *Dichondra repens*, Common Raspwort *Gonocarpus tetragynus*, Variable Stinkweed *Opercularia varia*, Greenhoods *Pterostylis* spp, and Mosquito Orchids *Acianthus* spp.

A total of seven habitat zones of differing quality were recorded (LHrF1 – LHrF7) with the differences in quality predominantly due to the presence/absence of Large Old Trees (LOTs), diversity of the understorey and extent of weed cover (Appendix 1.3). Zones LHrF4 and LHrF7 are located adjacent to the Boundary Road No. 34 track (Figure 3) and represented high quality remnants with an intact, mature overstorey and an understorey comprising a diverse range of species and life form structures. The remaining habitat zones were of low to moderate quality and contained modified, less diverse understorey components with a higher proportion of exotic species present, likely due to the ongoing disturbance associated with being located in a timber plantation.

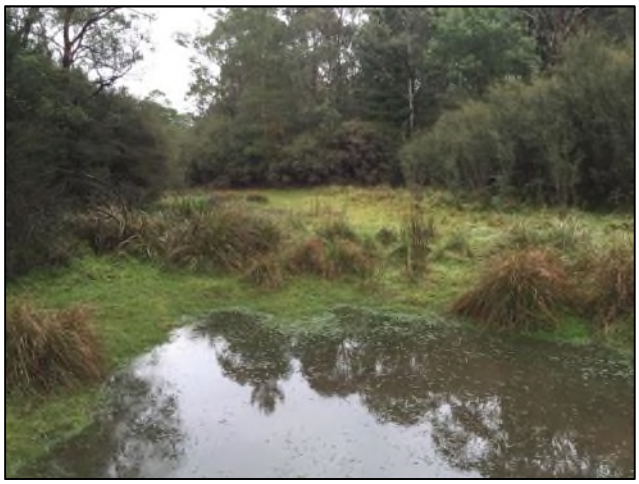

Plate 3. Lowland Herb-rich Forest within the study area (Ecology and Heritage Partners Pty Ltd 09/06/2016).

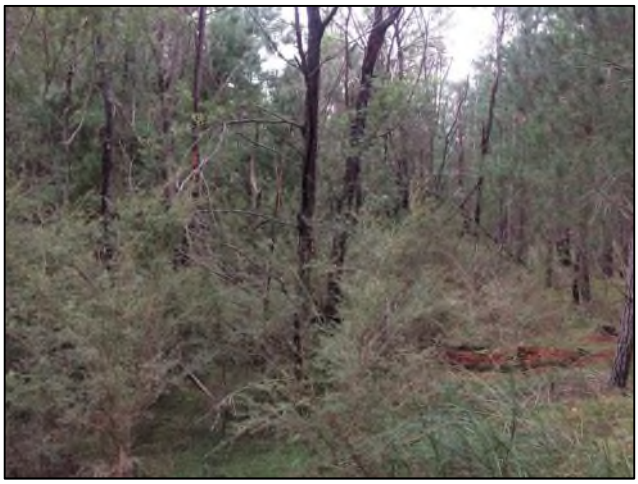

Plate 4. Lowland Herb-rich Forest within the study area (Ecology and Heritage Partners Pty Ltd 09/06/2016).

Plains Grassy Forest

Plains Grassy Forest is an open forest to 20 metres tall comprising a heathy shrub layer, and diverse graminoids and herbaceous ground layer in the understorey. It occurs on lowland plains and old river terraces (DELWP 2017b).

Plains Grassy Forest was predominately recorded to the north and east of the study area on the ridges and plains above gullies and valleys. The overstorey contained a diverse mix of Eucalypts including Red Box, Messmate *Eucalyptus obliqua*, Red Stringybark *Eucalyptus macrorhyncha*, and White Stringybark, with occasional Yellow Stringybark *Eucalyptus muelleriana* specimens also recorded (Figure 3; Plates 5 and 6).

The most common feature in the understorey was the presence of a high cover of Austral Bracken, which is a known recolonising plant after a bushfire event. Also present was a scattered shrub layer of Prickly Tea-tree, Black Wattle, Lightwood *Acacia implexa*, Burgan, Common Heath *Epacris impressa* and occasional specimens of Cherry Ballart *Exocarpos cupressiformis* and Drooping Sheoak *Allocasuarina littoralis*.

Native grasses and herbs present in the ground layer included Kangaroo Grass *Themeda triandra*, Forest Wire-grass, Tall Sundew *Drosera auriculata*, Sprawling Bluebell *Wahlenbergia gracilis*, Fireweed *Senecio* sp., Hairy Pennywort *Hydrocotyle hirta*, and Sheep's Burr *Acaena echinata*.

A total of 18 habitat zones of differing quality were recorded (PGF1-PGF18) with the differences in quality predominantly due to the presence/absence of LOTs, canopy extent, diversity of the understorey, extent of weed cover and the natural recruitment levels of woody species (Appendix 1.3). Most habitat zones were of low to moderate quality due to a high cover of weeds, and low diversity of species in the understorey. However, zones PGF11 and PGF13 represented high quality remnants with an intact, mature overstorey and an understorey comprising a diverse range of species and life form structures present. These higher quality patches of Plains Grassy Forest are located in the northern and southern sections of the study area, with patches of PGF13 also present in the Bairnsdale - Dargo Road reserve (Figure 3).

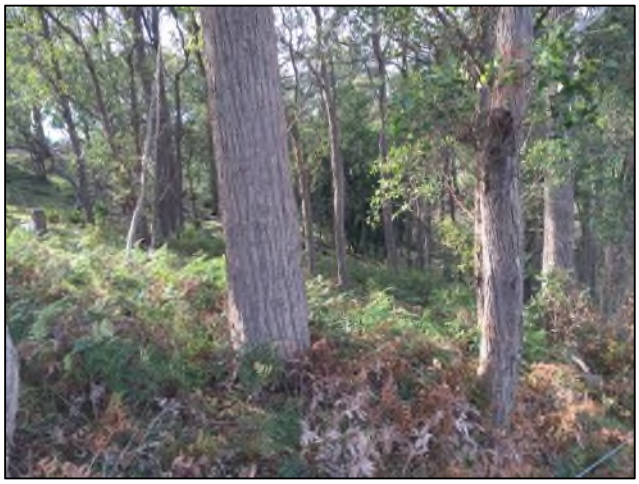

Plate 5. Plains Grassy Forest within the study area (Ecology and Heritage Partners Pty Ltd 08/06/2016).

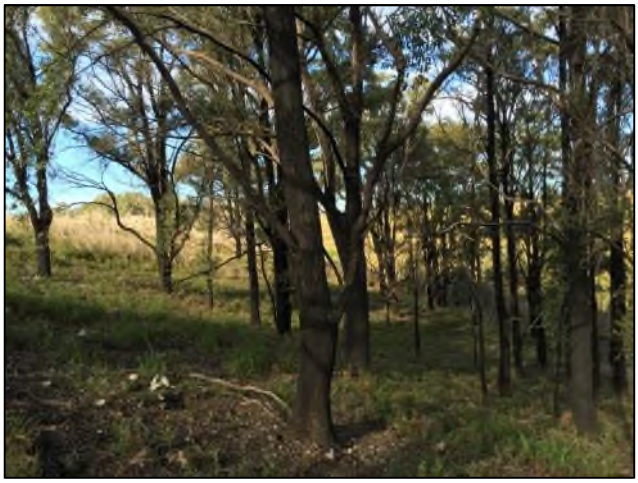

Plate 6. Plains Grassy Forest within the study area (Ecology and Heritage Partners Pty Ltd 09/06/2016).

Plains Grassy Woodland

Plains Grassy Woodland is typically characterised as an open Eucalypt woodland to 15 metres tall occurring over a wide variety of soil types on flat and undulating plains. The shrub layer is usually sparse, with a species-rich grass and herbaceous ground-layer (DELWP 2017b).

Plains Grassy Woodland was predominantly recorded on the plains in the central and western areas of the study area (Figure 3). The overstorey was dominated by Gippsland Red-Gum *Eucalyptus tereticornis* subsp. *mediana*; with occasional specimens of Red Box also present (Figure 3; Plates 7 and 8).

The understorey comprised the shrubs Burgan, Black Wattle and Common Rice-flower *Pimelea humilis*, with the grasses Kangaroo Grass, Wallaby Grass *Rytidosperma* spp., and Wattle Mat-rush common. Herb cover was low; however, specimens of Kidney Weed, Common Raspwort and Blue Bottle-daisy *Lagenophora stipitata* were observed.

A total of 11 habitat zones of differing quality were recorded (PGW1-PGW11) with the differences in quality predominantly due to the presence/absence of LOTs, canopy extent, diversity of the understorey, and extent of weed cover (Appendix 1.3).

Due to most patches being located in agricultural paddocks used for grazing, or in road reserves, most habitat zones were of low to moderate quality due to a high cover of weeds, and low diversity of species in the understorey. However, zones PGW8-PGW10 represented high quality remnants with an intact Eucalypt overstorey, and an understorey comprising a diverse range of species and life form structures. These higher quality patches of Plains Grassy Woodland are located in the reserves of Bairnsdale - Dargo Road and Fernbank- Glenaladale Road (Figure 3).

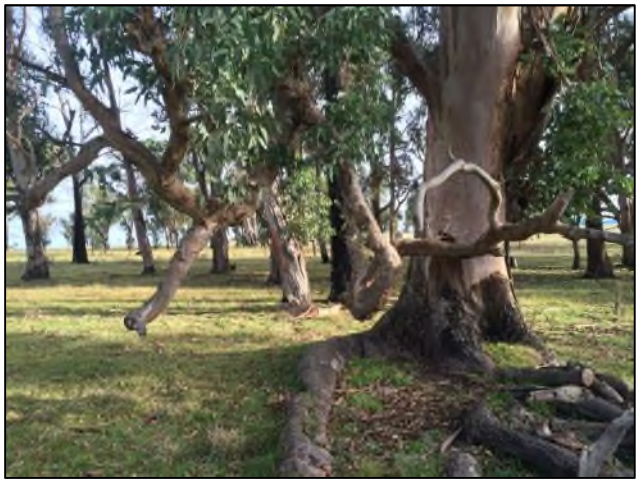

Plate 7. Plains Grassy Woodland within the study area (Ecology and Heritage Partners Pty Ltd 09/06/2016).

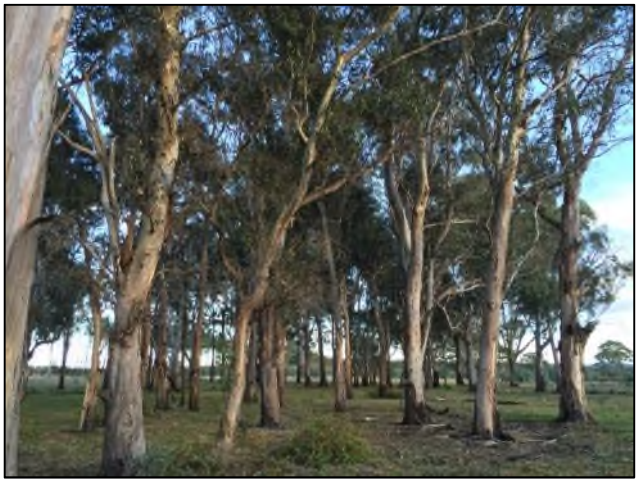

Plate 8. Plains Grassy Woodland within the study area (Ecology and Heritage Partners Pty Ltd 09/06/2016).

Valley Grassy Forest

Valley Grassy Forest is described as an open forest to 20 metres tall supporting a wide range of moisture tolerant Eucalypts over a sparse shrub layer, with a diverse range of graminoids, and herbs usually present. The EVC is usually found on fertile soils on gently undulating lower slopes and valley floors (DELWP 2017b).

Within the study area, Valley Grassy Forest was predominantly recorded to the north and east in gullies and along the lower slopes of the plain (Figure 3). The overstorey comprised a mixture of Eucalypts including Narrow-leaf Peppermint, Yellow Box *Eucalyptus melliodora*, Red Box, White Stringybark and Manna-gum (Figure 3; Plates 9 and 10).

Similar to Plains Grassy Forest, the understorey contained a high cover of Austral Bracken which smothered much of the ground-layer. Occasional shrubs were present including Sweet Bursaria *Bursaria spinosa* subsp. *spinosa*, Prickly Currant-bush *Coprosma quadrifida*, Golden Wattle, and Black Wattle. Of the graminoids and herbs, Nodding Blue-lily *Stypandra glauca* was particularly common, with Veined Spear-grass, Kangaroo Grass, Wattle Mat-rush, Common Raspwort and Small Poranthera *Poranthera microphylla* all present.

A total of 13 habitat zones of differing quality were recorded (VGF1-VGF13) with the differences in quality predominantly due to the presence/absence of LOTs, canopy extent, diversity of the understorey, natural levels of woody recruitment and extent of weed cover (Figure 3; Appendix 1.3). Due to the recent (2014) fire event, most patches contained a high cover of Austral Bracken, little evidence of woody recruitment and a low diversity of species in the understorey. As such, most patches are of low to moderate quality.

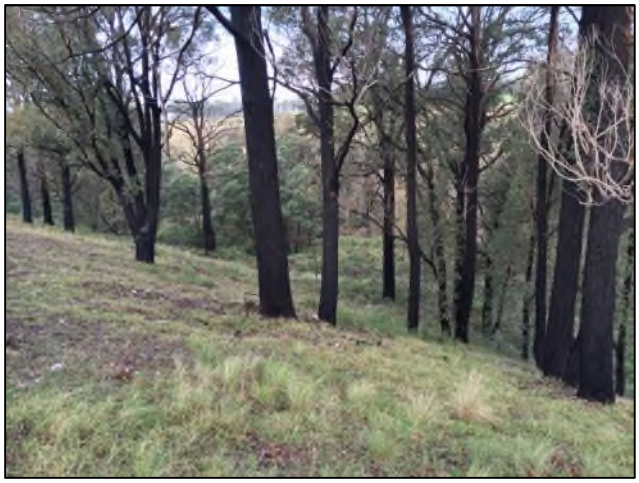

Plate 9. Valley Grassy Forest within the study area (Ecology and Heritage Partners Pty Ltd 06/06/2016).

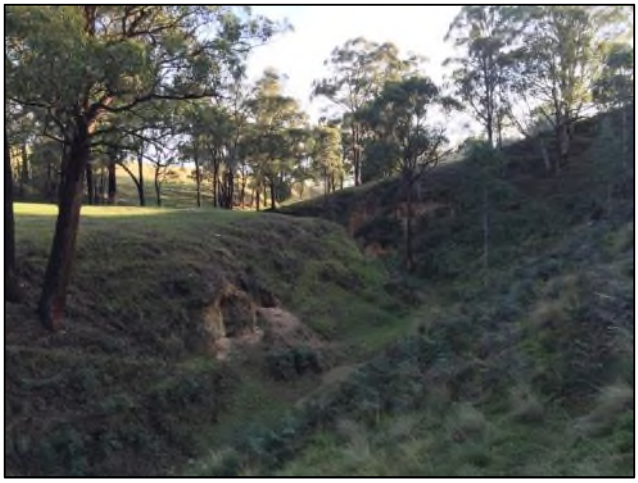

Plate 10. Valley Grassy Forest within the study area (Ecology and Heritage Partners Pty Ltd 06/06/2016).

Aquatic Herbland

Aquatic Herbland is typically a species-poor herbland occurring in permanent to semi-permanent wetlands dominated by sedges and/or aquatic herbs (DELWP 2017b).

Aquatic Herbland is present within some permanent waterbodies (farm dams) in the study area, with most patches dominated by one of, or a combination of, the species Tall Spike-sedge *Eleocharis sphacelata*, Common Reed *Phragmites australis* or Rush *Juncus* spp. Other species observed included Pacific Azolla *Azolla filiculoides*, Common Duckweed *Lemna disperma*, Water-milfoil *Myriophyllum* spp., and Slender Knotweed *Persicaria decipiens* (Figure 3; Plates 11 and 12).

Two habitat zones of differing quality were assessed (AH1 and AH2) with AH1 being of moderate quality, supporting a higher diversity of native species compared to AH2 which is of low quality (Figure 3; Appendix 1.3).

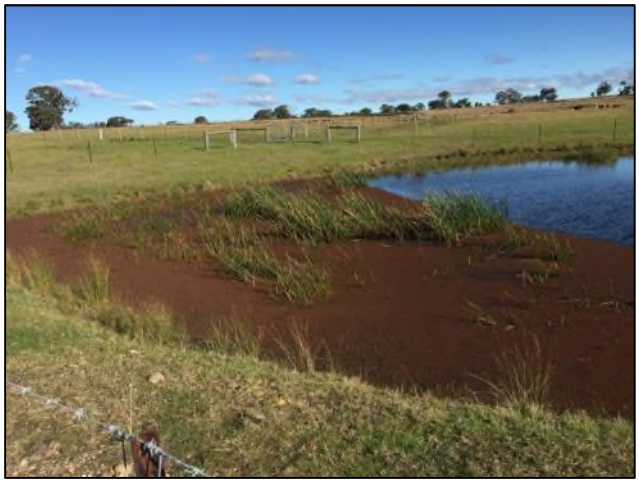

Plate 11. Aquatic Herbland within the study area (Ecology and Heritage Partners Pty Ltd 07/06/2016).

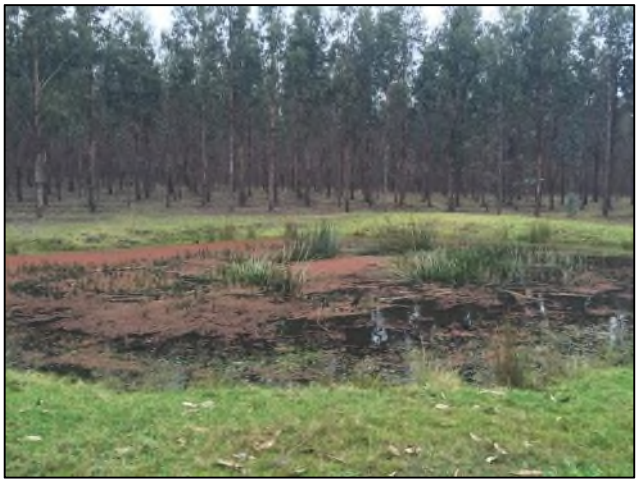

Plate 12. Aquatic Herbland within the study area (Ecology and Heritage Partners Pty Ltd 08/06/2016).

Plains Grassy Wetland

Plains Grassy Wetland is described as a (usually) treeless wetland dominated by grasses, sedges and herbs. The vegetation is typically species-rich on the outer verges, but usually species-poor in the wetter areas (DELWP 2017b).

Within the study area, Plains Grassy Wetland was recorded in low-lying areas, drainage lines or other depressions where minor wetlands had formed (Figure 3; Plates 13 and 14). Sedges were common in this EVC, with Water-milfoil, Common Spike-sedge *Eleocharis acuta*, Clustered Rush *Juncus vaginatus*, Finger Rush *Juncus subsecundus*, Sand Rush *Juncus continuus* and Small Loosestrife *Lythrum hyssopifolia* also present.

Two habitat zones of differing quality were recorded (PGWe1 and PGWe2), with PGWe1 supporting a higher diversity of native species compared to PGWe2 (Figure 3; Appendix 1.3).

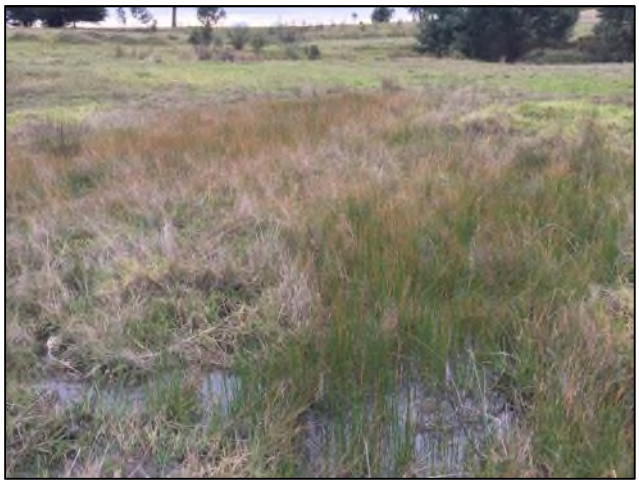

Plate 13. Plains Grassy Wetland within the study area (Ecology and Heritage Partners Pty Ltd 08/06/02/2016).

Plate 14. Water-milfoil within the study area (Ecology and Heritage Partners Pty Ltd 08/06/2016).

3.1.4 Fauna Habitat

3.1.4.1 Terrestrial Fauna Habitats

The fauna habitats across the study area exhibited evidence of sustained pastoral land-use. The cleared nature of much of the site, large areas dominated by introduced grasses and pasture species are evidence of a long history of agricultural land use.

Habitat features recorded in the study area generally include those associated with lowland forest, dry forest, plains woodland, wetlands and tributary streams, scattered trees, disturbed pasture and timber plantation. Primary survey sites were selected to achieve a representative sample of each fauna habitat type (Table 4). Detailed habitat assessments of each survey site are provided in Appendix 3.2 and a consolidated list of recorded fauna species, including corresponding habitats, is presented in Appendix 2.1.

3.1.4.2 *Aquatic Fauna Habitats*

The Aquatic Habitat Assessment sampled over 33 aquatic survey sites in creeks and gullies within the study area (Table 2; Figure 2). All of the waterways and water bodies where survey sites were established were set in either farm and/or forestry land and were impacted by land-use activities (i.e. clearing, grazing, cropping, logging, etc.). None of the waterways or water bodies assessed were considered to be in, or close to, their natural state.

It was also observed during the survey that some creeks and gullies appeared to have variable and permeable geology. There were instances where surface water was observed to be flowing at upstream sites (e.g. Sites 23-23) but not observable at downstream sites (e.g. Sites 28-30).

The survey sites were observed as being either dry, supporting pools of water or with minor flows. Where minor flows were observed, it was considered likely the flows were only temporary and due to the recent rains. Many sites were considered borderline as to whether they would constitute true aquatic habitat. These sites were observed to be mostly terrestrial habitats that were prone to wetting. Local landowners noted that many of the creeks and gullies in the northern and eastern sections of the study area only flowed for a short period after larger rainfall events and have a tendency to flash-flood. This anecdotal description was supported by the lack of ephemeral and permanent aquatic habitat at many sites.

Of the 33 sites assessed, 11 were found to have no aquatic habitat (Sites 1,2,6,9,14,15,16,20,27,28,29), ten had minimal aquatic habitat (3,4,8,10,11,12,17,18,19,21), nine had moderate (5,7,13,22,26,30,31,32,33) and three had good aquatic habitat (23,24,25) (Table 2; Figure 2). Descriptions of the habitat attributes recorded at each survey site are provided in Appendix 3.3 and water quality results are presented in Appendix 3.4.

All moderate habitat sites where characterised by dams with good aquatic habitat features (i.e. aquatic vegetation and good water quality), but with limited or unclear connectivity to downstream receiving waterways (i.e. likely limited aquatic fauna passage opportunities). These sites all had the potential to support aquatic fauna such as fish, amphibians and macroinvertebrates. However, their general lack of obvious connectivity to other aquatic habitats (many of the dams were perched on top of steep gullies), reduce the likelihood that they support significant aquatic biota features.

The three good quality habitat sites (Sites 23-25) were all connected to each other and supported some aquatic fauna (namely frogs) along the entire reach (Figure 2). Located on a tributary of Honeysuckle Creek these sites were considered likely to support a range of aquatic fauna.

Despite the potential impediment to aquatic fauna passage, posed by the isolation and disconnectedness of many of the moderate and good quality survey sites, it is possible populations of fish and/or other aquatic fauna were resident prior to the installation of barriers (i.e. dams and culverts, plantations, roads, etc.) being built and may have established isolated populations that still exist.

3.1.4.3 *Connectivity of Habitat*

A number of waterways (including tributary streams, drains and soaks) throughout the study area are interconnected and provide high habitat connectivity for species reliant upon aquatic habitat including frogs, fish and waterbirds.

Vegetated road reserves, particularly along Fernbank-Glenaladale Road and Bairnsdale-Dargo Road, provide good connectivity for a variety of woodland dependent species, including woodland birds, arboreal mammals, small ground-dwelling mammals and reptiles. These roadside reserves provide connectivity with large areas of native bushland located north and south of the study area. Scattered trees within paddocks throughout the study area may act as means of connection for more mobile fauna, including birds, microbats and arboreal mammals.

Wildlife corridors and scattered connections of vegetation have numerous benefits to native fauna populations, particularly in modified landscapes where much of the surrounding vegetation is restricted to linear strips along roadsides or streams. They can, and often do constitute valuable habitat in their own right. Some of the key benefits of wildlife corridors associated with the maintenance of biodiversity on a local, and at a landscape level, include:

- Protection and ongoing maintenance of ecosystem functionality through the reduction of threatening processes, such as erosion, weed spread, hydrological alterations;
- Provision of habitat (refuge, shelter, breeding opportunities) for a range of fauna either residing within corridors, or moving through the landscape;
- Maintenance of species richness and diversity;
- Immigration of animals to supplement declining populations, thus reducing the likelihood of local extinctions;
- Availability of habitat for reintroduction following extinction events;
- Prevent demographic changes occurring in populations that may result from prolonged isolation from other populations of the same species by aiding gene flow, thus enhancement of genetic variation and prevention of inbreeding; and,
- Facilitating fauna movement through modified landscapes to more optimal habitats.

Aside from the large, contiguous patches of native vegetation within road reserves and the dissecting gullies, other areas of native vegetation in the study area do not constitute a wildlife corridor as such (i.e. not contiguous with larger areas of habitat in the local area). They are however likely to act as a means of connectivity, providing habitat and facilitating the movement of species throughout the landscape. The study area therefore contributes to the role that remnant native vegetation in the local area has in conserving fauna.

3.2 Nationally Significant Features

Matters of NES are listed and protected under the EPBC Act. Matters of NES relating to biodiversity are discussed below in relation to the project based on the results of the PMST (DoEE 2017a), desktop review of literature, and the results of field surveys.

3.2.1 Flora Species

No nationally significant flora species have been recorded within the study area, noting that extensive targeted flora surveys were undertaken in October and November 2016 (Figure 4).

The VBA contains records of four nationally significant flora species previously recorded within 10 kilometres of the study area (the study area locality) (DELWP 2016a) (Appendix 2.2; Figure 4). The PMST nominated an additional four nationally significant species which have not been previously recorded but have the potential to occur in the study area locality.

Of the eight nationally significant flora species known or considered likely to occur within the study area locality, three are considered to have a moderate or higher likelihood of occurrence within the study area:

- Swamp Everlasting *Xerochrysum palustre* (Vulnerable) - Recorded six times within the study area locality and within 3.3 kilometres of the study area. This species occurs in wetlands including sedge-swamps and shallow freshwater marshes, often on heavy black clay soils. It has also been recorded in areas of native grassland and heath communities (DoEE 2017b).
- Dwarf Kerrawang *Commersonia prostrata* (Endangered) - Recorded 11 times within the study area locality and within 3.8 kilometres of the study area. This species occurs on swampy, sometimes ephemeral, wetlands and lake margins, often dominated by *Lepidosperma* spp. (DoEE 2017b).
- Gaping Leek-orchid *Prasophyllum correctum* (Endangered) - Recorded four times within the study area locality and within 3.4 kilometres of the study area. This species occurs on freely draining sandy loam soils and is associated with grassland and woodland vegetation communities (DoEE 2017b).

Given these species were not detected through targeted surveys; any populations within the study area are expected to be very small in numbers and possibly represented by only a few individuals. The likelihood of the remaining nationally significant species occurring within the study area is considered low due to the absence of suitable habitat and/or lack of records in close proximity (Appendix 1.2; Figure 4).

3.2.2 Fauna Species

3.2.2.1 Threatened Species

No nationally significant fauna species have been recorded within the study area (Figure 5).

The VBA contains records of 12 nationally significant fauna species previously recorded within 10 kilometres of the study area (the study area locality) (DELWP 2016a) (Appendix 2.2; Figure 5). The PMST nominated an additional nine nationally significant species which have not been previously recorded but have the potential to occur in the study area locality.

Of the 21 nationally significant fauna species known or considered likely to occur within the study area locality, five are considered to have a moderate likelihood of occurring within the study area (Appendix 2.2):

- Swift Parrot *Lathamus discolor* - Recorded twice within the study area locality and within 6.2 kilometres of the study area. This species breeds in Tasmania from September to April and then migrates to the mainland during April. On mainland Australia, Swift Parrots largely inhabit dry open Eucalypt forests and woodlands, especially box-ironbark forests. This species is also regularly recorded in urban and rural areas during late autumn and over the winter months feeding on flowering trees (and lerp), particularly Eucalypts such as Grey Box *Eucalyptus microcarpa*, Red Ironbark *Eucalyptus tricarpa*, Mugga Ironbark *Eucalyptus sideroxylon*, Yellow Gum *Eucalyptus leucoxylon*, White Box *Eucalyptus albens* and Red Gum *Eucalyptus camaldulensis* (DoEE 2017b).

This species is considered likely to visit the study area on occasion during the over-wintering period, foraging for lerps and within the winter-flowering Eucalypt species.

- Painted Honeyeater *Grantiella picta* - The closest record of this species is located approximately 50 kilometres from the study area, within the Colquhoun Regional Park.

  The species inhabits mistletoes in Eucalypt forests/woodlands, riparian woodlands of Black Box and River Red Gum, Box-Ironbark-Yellow Gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarinas, Callitris, and trees on farmland or gardens. It is known to prefer woodlands which contain a higher number of mature trees, as these host more mistletoes (DoEE 2017b).

  Although not recorded within the study area locality, woodland habitats and scattered trees within the study area provide suitable habitat for this species.

- Grey-headed Flying-fox *Pteropus poliocephalus* - The closest record of this species is located approximately 16 kilometres from the study area. The species was formerly an autumn-winter visitor to areas throughout Victoria; however, it has now established permanent and seasonal colonies throughout the state, including within Bairnsdale. The species is capable of nightly flights of up to 50 km from roost sites to forage on the nectar and pollen of native and introduced plant species.

  Owing to the large foraging range and nomadic nature of this species, individuals are likely to utilise foraging resources within the study area on occasion. There are no roost sites present within the site.

- New Holland Mouse *Pseudomys novaehollandiae* - Recorded extensively (in 2016) throughout the Providence Ponds Flora and Fauna Reserve, located approximately eight kilometres from the study area (DELWP 2016a). The species is known to inhabit a range of habitat types, including open heathland, open woodland with a heathy understorey and vegetated sand dunes. On mainland Australia the species has been found to peak in abundance during the early-mid stages of vegetation succession three to five years after fire (DoEE 2017b).

  Woodland habitats within the study area provide suitable habitat for this species and it is considered to have a moderate likelihood of occurring on site.

- Giant Burrowing Frog *Heleioporus australiacus* - Previously recorded (in 2003) within 6.3 km of the study area, within the Mitchell River National Park (Stony Creek) (DELWP 2016a). In the southern portion of its range, the species has been reported to occur in a wide range of forest communities including montane sclerophyll woodland, montane riparian woodland, as well as wet and dry sclerophyll forest. Examination of known sightings suggests that most records occur in dry sclerophyll forests and reported use of wet habitats are all associated with breeding sites, which the species occupies for relatively short periods each year.

  Information relating to the habitat requirements and ecology of this cryptic species are limited; however based on known survey records, Eucalypt forests and tributary streams within the study area are considered to provide suitable habitat. Giant Burrowing Frog was not recorded during the field survey event; however the low detectability of this species is well documented.

Adopting the precautionary principle, it is considered that there is a moderate likelihood of this species occurring within the study area.

The likelihood of the remaining nationally significant species occurring within the study area is considered low due to the absence of suitable habitat and/or lack of records in close proximity (Appendix 2.2; Figure 5).

3.2.2.2 Migratory Species

Migratory species listed under the EPBC Act are those protected under international agreements to which Australia is a signatory. These include the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA), the Republic of Korea Migratory Bird Agreement (ROKAMBA), and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered matters of NES under the EPBC Act.

One species of bird recognised under the migratory provisions of the EPBC Act, the Rufous Fantail, was recorded in the study area during field surveys. An additional 18 EPBC Act-listed migratory or marine species have been recorded within 10 kilometres of the study area (Table A2.3, Appendix 2.2).

While migratory species of bird inhabit the study area and locality, the site is not classed as an 'important habitat' as defined under the EPBC Act Policy Statement 1.1 Principal Significant Impact Guidelines (DoE 2013), in that it does not contain:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species;
- Habitat utilised by a migratory species which is at the limit of the species range; or,
- Habitat within an area where the species is declining.

3.2.3 Ecological Communities

Two nationally listed ecological communities are predicted to occur within 10 kilometres of the study area (DoEE 2017a):

- Gippsland Red Gum (*Eucalyptus tereticornis* subsp.*mediana*) Grassy Woodland and Associated Native Grassland (GRGGW); and,
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.

The GRGGW ecological community is present within the study area in high quality Plains Grassy Woodland remnants located within the road reserve of Fernbank-Glenaladale Road and Bairnsdale-Dargo Road (Figure 3). Four discrete patches of Plains Grassy Woodland correspond with the community, covering a total area of 2.84 hectares. The determination as to which patches qualified as the community was made using the condition thresholds described in the approved conservation advice for the species (DEWHA 2008). Patches that failed to qualify did so due to a high non-grass weed cover (i.e. >50%), a failure to meet the minimum patch size (0.5 hectares), or a lack of diversity in the understorey (particularly in the case of derived grasslands).

The ecological community is limited to the central Gippsland Plain and occurs in two forms, a grassy woodland form and as derived native grassland. Areas of GRGGW within the study area are representative of the grassy woodland form, which is characterised as having a tree canopy with a projective foliage cover of more than five percent and being dominated by Gippsland Red Gum.

The ground layer is often covered by native perennial tussock grasses and grass-like plants with a variety of wildflowers such as daisies, lilies and orchids, occupying the spaces between tussocks (DEWHA 2008).

3.2.4 Other Matters of NES

The study area does not support any other features corresponding with matters of NES protected under the EPBC Act (e.g. World or National Heritage Areas). The closest Ramsar wetland is the Gippsland Lakes system, located approximately 20 kilometres south-east of the study area. The wetland covers an area of approximately 60,000 hectares and encompasses three main waterbodies, including Lake Wellington, Lake King and Lake Victoria.

3.3 State Significant Features

Biodiversity matters present within the study area that are considered of significance to the State of Victoria are outlined below.

3.3.1 Flora species

Field surveys recorded four State significant species within the study area, all of which are listed only on the Victorian Advisory List (i.e. not listed as Threatened under the FFG Act) (Figure 4):

- Slender Wire-lily *Laxmannia gracilis* (Rare) - 33 individual plants recorded at four separate locations, including the reserve of Bairnsdale-Dargo Road (Plains Grassy Forest) (6 individuals) and a gully supporting Lowland Herb-rich Forest in the western section of the study area (27).
- Blue Mat-rush *Lomandra glauca s.s* (Status Poorly Known) - Three individual plants recorded at two separate locations supporting Lowland Herb-rich Forest, including the reserve of Limpyers Road (1) and a gully in the western section of the study area (2).
- Slender Tick-trefoil *Desmodium varians* (Status Poorly Known) - One individual plant recorded in a gully supporting Valley Grassy Forest in the eastern section of the study area (Lucas Creek).
- Sandfly Zieria *Zieria smithii* subsp. *smithii* (Rare) - Nine individual plants recorded at seven separate locations supporting Lowland Herb-rich Forest within the timber plantation.

No additional State significant flora species have been recorded within the study area, despite the completion of targeted flora surveys in October and November 2016. The field surveys did record a high abundance of species listed as 'Protected' under the FFG Act, including species from the Acacia (42 individual plants), Asteraceae (194), Ericaceae (59), Orchidaceae (394), Pteridophyta (68), Stylidium (2) and Xanthorrhoea (2) plant families.

The VBA contains records of an additional 41 State significant flora species previously recorded within 10 kilometres of the study area (the study area locality) (DELWP 2016a) (Appendix 1.2; Figure 4). In addition to the species nominated by database searches, three State significant species not previously recorded in the study area locality were identified as having the potential to occur on site and assessed accordingly (Appendix 1.2).

Of the 44 State significant flora species considered, nine have been assigned a high likelihood of occurring within the study area (Appendix 1.2):

- Southern Bristle-sedge *Chorizandra australis*
- Long-flower Beard-heath *Leucopogon juniperinus*
- Small-leaf Bush-pea *Pultenaea foliosa*
- Tall Wasp Orchid *Chiloglottis trilabra*
- Purple Diuris *Diuris punctata* (listed under the FFG Act)
- Red-tip Greenhood *Pterostylis sp. aff. Parviflora*
- Woolly Waterlily *Philydrum lanuginosum*
- Veined Spear-grass *Austrostipa rudis* subsp. *australis*
- Bushy Hedgehog-grass *Echinopogon caespitosus var. caespitosus*

A further 27 State significant flora species are considered to have a moderate likelihood of occurrence (Appendix 1.2).

Given these species were not detected through targeted surveys; any populations within the study area are expected to be very small in numbers and possibly represented by only a few individuals. The likelihood of the remaining State significant species occurring within the study area is considered low due to the absence of suitable habitat and/or lack of records in close proximity (Appendix 1.2; Figure 4).

3.3.2 Fauna Species

Field surveys recorded one State significant species within the study area, the Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*. Anabat surveys recorded this species at five of the eight surveyed Anabat sites (LF2, DF1, DF2, DF3 and PW2) (excluding site W1 due to unit fail). This hollow-dwelling species is listed under the FFG Act and classified as Near Threatened on the Victorian Advisory List (DSE 2013). There are limited records of Yellow-bellied Sheathtail Bat in Victoria and it is considered that this species is a migrant, if not vagrant, to Victoria (Lumsden and Platt 1991; DSE 2013). The species is considered a rare visitor to Victoria, with records of the species usually sourced from the southern half of the State from late summer and autumn (OEH 2017).

In addition to the Yellow-bellied Sheathtail Bat, the Anabat survey recorded one potential call of the Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* at Site LF1. The call has been attributed to the Large Forest Bat / Eastern Bent-wing Bat complex, as it could not be accurately assigned to either species (Appendix 3.5). Eastern Bent-wing Bat is a cave-dwelling species and is listed under the FFG Act and classified as Vulnerable on the Victorian Advisory List (DSE 2013).

The species is known to travel long distances when foraging, with females being recorded travelling up to 65 kilometres in one night (Churchill 1998). Canopy vegetation across the study area, including scattered trees, provide suitable foraging habitat for this species.

The VBA contains records of an additional 25 State significant fauna species previously recorded within the study area locality (DELWP 2016a) (Appendix 2.2; Figure 5). Of these species, 11 are considered to have a moderate likelihood of occurring within the study area:

- Eastern Great Egret *Ardea modesta*
- Grey Goshawk *Accipiter novaehollandiae novaehollandiae*
- Black Falcon *Falco subniger*
- Powerful Owl
- Masked Owl
- Brown Treecreeper (south-eastern ssp.) *Climacteris picumnus victoriae*
- Chestnut-rumped Heathwren *Calamanthus pyrrhopygius*
- Speckled Warbler *Chthonicola sagittatus*
- Hooded Robin *Melanodryas cucullata cucullata*
- Diamond Firetail *Stagonopleura guttata*
- Southern Toadlet *Pseudophryne semimarmorata*

The likelihood of the remaining State significant species occurring within the study area is considered low due to the absence of suitable habitat and/or lack of records in close proximity (Appendix 2.2; Figure 5).

3.3.3 Ecological Communities

A review of the Modelled FFG Act Communities data layer contained on the DELWP Biodiversity Interactive Map (DELWP 2017a) indicated the potential for two State significant ecological communities to occur in the study area, namely the Forest Red Gum Grassy Woodland and Central Gippsland Plains Grassland communities. These ecological communities correspond with the Plains Grassy Woodland and Plains Grassy Forest vegetation types and can include areas classified as the EPBC Act-listed GRGGW community (Section 3.2.3).

Field surveys confirmed the presence of the Forest Red Gum Grassy Woodland ecological community within the study area. The community is represented by higher quality patches of Plains Grassy Woodland (habitat zones PGW8, 9 and 10) and covers approximately 5.11 hectares of land within the study area (Figure 3). These areas support a diverse array of native species and lifeforms.

3.3.4 Ecologically Significant Sites

The study area does not contain any designated conservation reserves; however the following reserves are located within 10 kilometres of the study area (Figure 1):

- Mitchell River National Park - Established in 1962, this reserve covers approximately 14,250 hectares of land. The southern extent of the park is located approximately 4.4 kilometres north of the study area.

- Providence Ponds Flora and Fauna Reserve - Established in 1984, this reserve covers approximately 2,420 hectares of land. The northern extent of the park is located approximately 6.4 kilometres south of the study area.
- Fernbank Nature Conservation Reserve - Established in 1978, this reserve covers approximately 2.2 hectares of land. The park is located approximately 7.2 kilometres south of the study area.
- Saplings Morass Flora and Fauna Reserve - Established in 1984, this reserve covers approximately 10.2 hectares of land. The park is located approximately 3.4 kilometres south of the study area.

Sites of Biological Significance (BioSites) are areas containing biological assets that contribute to the conservation of Victoria's indigenous flora and fauna. The identification of BioSites allows for the prioritisation of conservation management and reservation, and incorporation of these assets into regional and local planning procedures.

One BioSite, Redcourt Lane (#1682), is mapped by DELWP within the study area. This BioSite is considered to be of State significance and overlaps the area of the Limpyers Road reserve covered by the ESO (51) (Section 1.2; Figure 1). The following additional BioSites are mapped within five kilometres of the study area by DELWP:

- Nationally Significant**:** Deep Water Morass (5679), Fernbank - Lindenow South rail reserve (Grass GPBD004) (3384), Skull Creek (5681), Lindenow South 3 (6160), Stockdale-Fernbank Rd (1752), Providence Ponds Flora and Fauna Reserve (1745) and Lindenow South (1685).
- State Significant: Skull Creek Wetland (5677), Lindenow South 2 (5729), Iguana Creek (5676) and Saplings Morass (5680).

3.4 Regionally Significant Features

Field surveys recorded two regionally significant fauna species within the study area, Emu *Dromaius novaehollandiae novaehollandiae* and Eastern Long-necked Turtle *Chelodina longicollis*. Both species are relatively common within the study area locality.

The VBA contains records of an additional 10 regionally significant fauna species previously recorded within the study area locality (DELWP 2016a) (Appendix 2.2; Figure 5). Of these species, six are considered to have a moderate likelihood of occurring within the study area:

- Nankeen Night Heron *Nycticorax caledonicus hillii*
- Royal Spoonbill *Platalea regia*
- Azure Kingfisher *Alcedo azurea*
- Spotted Quail-thrush *Cinclosoma punctatum*
- Eastern Pygmy-possum *Cercartetus nanus*
- Dendy's Toadlet *Pseudophryne dendyi*

The likelihood of the remaining regionally significant species occurring within the study area is considered low due to the absence of suitable habitat and/or lack of records in close proximity (Appendix 2.2; Figure 5).

4 SUMMARY OF ECOLOGICAL FEATURES

The study area is representative of many areas within the East Gippsland region as it has been previously disturbed for agriculture and possesses large areas of improved pastures and derived native grasslands with scattered patches of remnant vegetation and regrowth from past clearing. The majority (959 ha or 86%) of land surveyed is classified as modified and disturbed land. The remaining areas support native vegetation represented by seven EVCs.

Much of this indigenous vegetation and good quality terrestrial fauna habitat remaining within the study area is confined to roadsides and the dissecting gullies, which have been less affected by past land clearing and sustained agricultural land use. The large and relatively well connected remnants in these areas are complimented by smaller, fragmented patches of native vegetation and scattered trees which persist in modified areas.

The desktop and field assessments identified a number of key ecological features within the study area and surrounding landscape; these are summarised in Table 12. The ecological features recorded or predicted to occur within the study area are associated with six distinct ecological groupings. The defined groups and corresponding ecological features are detailed in Table 13.

The findings presented in this ecological characterisation report will support the project EES and assessment under the Commonwealth EPBC Act. The succeeding reports will include further detail regarding the proposed activity, the implications of environmental legislation and policy, and measures for avoiding, minimising and offsetting known and potential impacts on the ecological features identified in this report.

Table 12. Key ecological features

Species diversity	• A diverse assemblage of plants and animals, with 174 flora species and 96 fauna species recorded during the field surveys.
Remnant vegetation	• 142.35 hectares of remnant vegetation represented by seven EVCs: o Lowland Forest (2.77ha); o Lowland Herb-rich Forest (13.38ha); o Valley Grassy Forest (67.29ha); o Plains Grassy Forest (52.14ha); o Plains Grassy Woodland (11.34ha); o Aquatic Herbland (1.11ha); and, o Plains Grassy Wetland (0.18ha). • 351 native scattered trees, consisting predominately of large, old (>100 years) Eucalypt species.
Wetlands	• 1.83 hectares of land classified by the Victorian Department of Environment, Land, Water and Planning (DELWP) as a 'Current Wetland'. • The Gippsland Lakes Ramsar site, located within 20 kilometres of the study area (downstream).
Significant ecological communities	• 2.84 hectares of the nationally significant (EPBC Act-listed) Gippsland Red Gum (*Eucalyptus tereticornis subsp. mediana*) Grassy Woodland and Associated Native Grassland ecological community. • 5.11 hectares of the State significant (*Victorian Flora and Fauna Guarantee Act 1988* [FFG Act] listed) Forest Red Gum Grassy Woodland ecological community.

Significant flora species	• The known occurrence of four State significant flora species" o Slender Wire-lily *Laxmannia gracilis*; o Blue Mat-rush *Lomandra glauca s.s.*; o Slender Tick-trefoil *Desmodium varians*; and, o Sandfly Zieria *Zieria smithii* subsp. *smithii*. • The potential occurrence (moderate or high likelihood) of three nationally significant species: o Swamp Everlasting *Xerochrysum palustre*; o Dwarf Kerrawang *Commersonia prostrata*; and, o Gaping Leek-orchid *Prasophyllum correctum*. • The potential occurrence (moderate or high likelihood) of 36 State significant species within the study area.
Significant fauna species	• The known occurrence of one State significant fauna species (Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*). • The potential occurrence of five fauna species of national significance: o Swift Parrot *Lathamus discolor*; o Painted Honeyeater *Grantiella picta*; o Grey-headed Flying-fox *Pteropus poliocephalus*; o New Holland Mouse *Pseudomys novaehollandiae*; and, o Giant Burrowing Frog *Heleioporus australiacus* . • The Aquatic Habitat Assessment determined that the study area supports suitable habitat for Dwarf Galaxias; however the species is considered to have a low likelihood of occurring on site due to the lack of local records (noting a paucity of targeted survey effort). • The potential occurrence of 12 State significant species. • The known occurrence of two regionally significant fauna species (Emu *Dromaius novaehollandiae novaehollandiae*, Eastern Long-necked Turtle *Chelodina longicollis*) and the potential occurrence of an additional six regionally significant species.
Significant sites	• Four designated conservation reserves within 10 kilometres of the study area: o Mitchell River National Park; o Providence Ponds Flora and Fauna Reserve; o Fernbank Nature Conservation Reserve; and, o Saplings Morass Flora and Fauna Reserve.

Table 13. Defined ecological groupings and corresponding ecological features

Defined Group	Location	Corresponding known and potential ecological features			
		Native vegetation	Significant Species	Significant Ecological Communities	Other Features
Remnant vegetation and aquatic habitat associated with ephemeral tributary streams	The eastern and western sections of the study area, including three primary tributaries in the eastern half of the site (Perry Gully, Simpson Gully and Lucas Creek) and the unnamed tributary stream which dissects the timber plantation	• Remnant patches of Valley Grassy Forest, Lowland Herb-rich Forest and Plains Grassy Forest • Scattered trees	• Recorded significant flora species: o Slender Wire-lily o Blue Mat-rush o Slender Tick-trefoil o Sandfly Zieria • Recorded significant fauna species: o Eastern Long-necked Turtle o Yellow-bellied Sheathtail Bat • Additional significant species (plants, birds, mammals, frogs and reptiles) considered to have a moderate or higher likelihood of occurring on site	None present	• DELWP mapped 'Current Wetlands' • Habitat connectivity between ephemeral tributary streams and large areas of native bushland located north and south of the study area
Riparian and wetland habitats associated with scattered farm dams and soaks	Across the study area	• Aquatic Herbland • Plains Grassy Wetland	• Recorded significant fauna species: o Eastern Long-necked Turtle • Additional significant species (particularly frogs)	None present	• Habitat connectivity between on site waterbodies and aquatic habitats present in the surrounding landscape • These features provide habitat for aquatic species and important water resources for terrestrial fauna

Defined Group	Location	Corresponding known and potential ecological features			
		Native vegetation	Significant Species	Significant Ecological Communities	Other Features
Roadside vegetation	Fernbank-Glenaladale Road and Bairnsdale-Dargo Road. Local roads, farm access tracks and plantation tracks are also present within the study area	• Remnant patches of Plains Grassy Woodland, Plains Grassy Forest, Lowland Forest and Lowland Herb-rich Forest • Scattered trees	• Recorded significant flora species: o Blue Mat-rush o Slender Wire-lily o Sandfly Zieria • Additional significant species (plants, birds and mammals)	• EPBC Act-listed GRGGW ecological community • FFG Act-listed Forest Red Gum Grassy Woodland ecological community	• Habitat connectivity between vegetated road reserves in the study area and large areas of native bushland located north and south of the site • BioSite: Redcourt Lane (#1682) • Planning overlays (ESO51 and VPO1)
Scattered trees	Throughout the study area, commonly occurring in farm paddocks with little or no associated indigenous vegetation, and around the tributary streams	• Scattered trees, comprising of nine different species and stags (dead trees)	• Significant fauna species considered to have a moderate or higher likelihood of occurring on site, particularly birds and mammals (microbats)	None present	• Habitat connectivity between scattered trees within the study area and bushland in the surrounding landscape

Defined Group	Location	Corresponding known and potential ecological features			
		Native vegetation	Significant Species	Significant Ecological Communities	Other Features
Timber plantations	Present within the western section of the study area, encompassing approximately 450 hectares (~30%) of the site	• Fragmented patches of Plains Grassy Woodland in harvested areas and Lowland Herb-rich Forest associated with dissecting tributary streams • Scattered trees	• Recorded significant flora species (all associated with dissecting tributary streams): o Blue Mat-rush o Slender Wire-lily o Sandfly Zieria • Recorded significant fauna species (harvested areas): o Emu o Yellow-bellied Sheathtail Bat • Additional significant species (birds, mammals)	None present	• Habitat connectivity between the native vegetation and aquatic habitats in the plantations and surrounding habitats.
Land substantially modified as a result of anthropogenic activities (largely agricultural)	Throughout the study area, with the majority (86%) of land surveyed within the study area being classified as being modified and disturbed	• Scattered, fragmented patches of remnant vegetation • Scattered trees	Scattered remnant patches and trees provide suitable habitat for significant fauna species considered to have a moderate or higher likelihood of occurrence on site. Degraded grasslands are of limited habitat value	None present	• Habitat connectivity between scattered patches and trees and surrounding habitats.

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