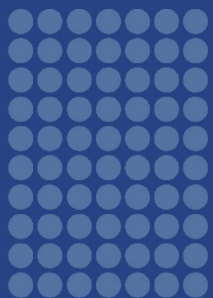
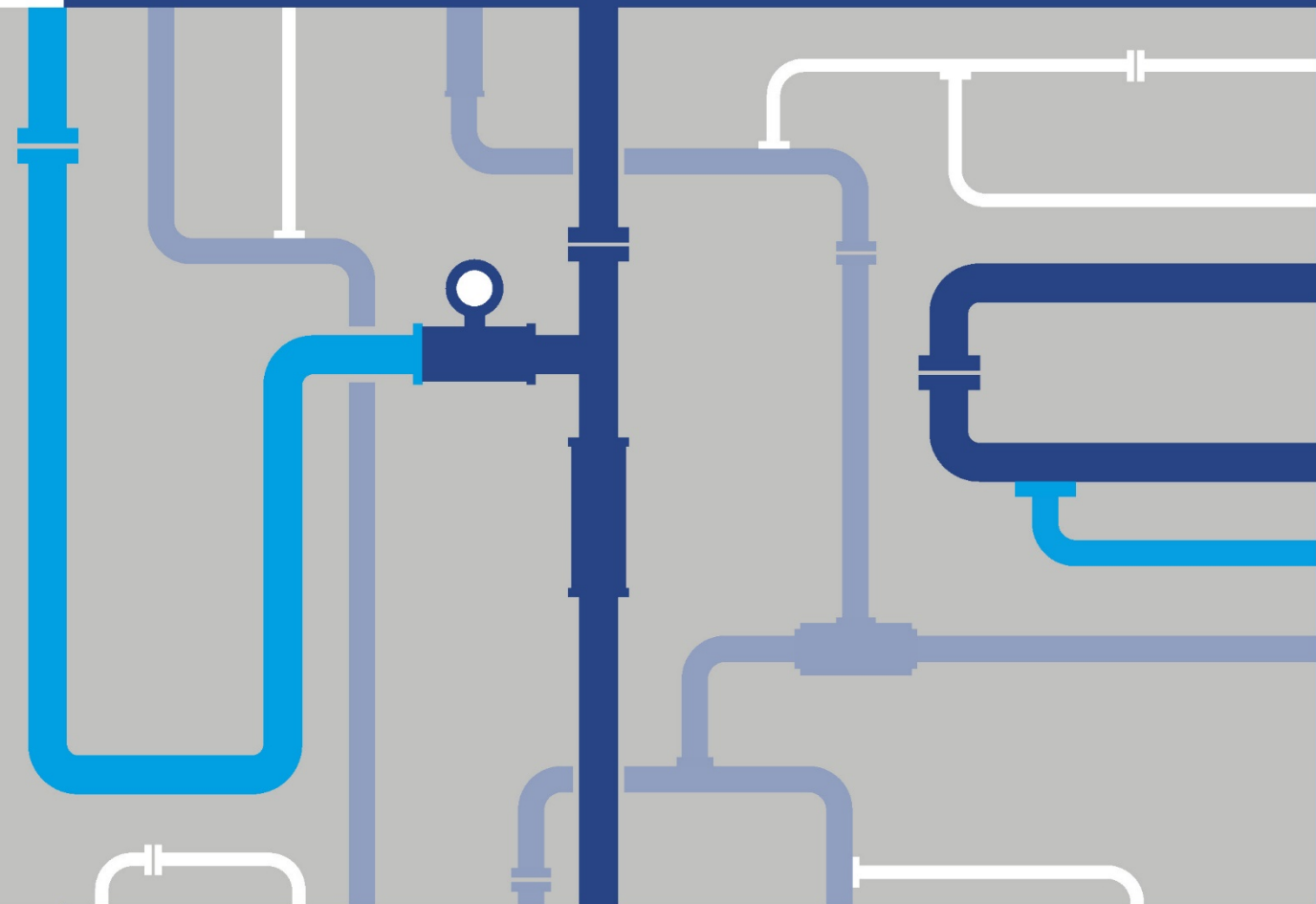




chapter 7

# biodiversity.



Environment Effects Statement | May 2021

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## 7.1 Introduction

This chapter provides an assessment of the biodiversity impacts associated with the construction and operation of the Western Outer Ring Main (WORM) gas pipeline project (the Project). This chapter is based on the impact assessment presented in Technical report A *Biodiversity and habitats*.

### What is biodiversity?

The variety of all life forms. It is different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part.

The biodiversity of Victoria and Australia is valued by the community and is recognised through legislation and policies which are designed to conserve native flora, fauna, habitat and ecological communities. Accordingly, an understanding of existing ecological values along the Project alignment and the regional/national context is critical to assess the potential residual impacts.

The EES scoping requirements set out the following evaluation objective relevant to biodiversity:

- Avoid and minimise potential adverse effects on vegetation, listed threatened and migratory species and ecological communities, and habitat for these as well as restore and offset residual environmental effects consistent with relevant State policies and Federal legislation.

To assess the potential effects on ecological values from construction and operation of the Project, a biodiversity impact assessment was undertaken. The assessment included extensive surveys including both aquatic and terrestrial habitat in the study area to determine the flora, fauna and ecological communities present and gain an understanding of the ecological values in the construction corridor. This was followed by an assessment of the Project's impact on the existing values.

The Project would impact Matters of National Environmental Significance (MNES) listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and therefore requires a specific assessment under that Act. Chapter 18 sets out the MNES assessment.

Other aspects of the EES related to the biodiversity evaluation objective include surface water, groundwater, ground movement, contamination, noise and vibration, landscape and visual, social, and land use. These are addressed in the following reports and chapters:

- Technical report B and Chapter 8 *Surface water*
- Technical report C and Chapter 8 *Groundwater*
- Technical report D and Chapter 9 *Land stability and ground movement*
- Technical report E and Chapter 10 *Waste (contamination and greenhouse gas)*
- Technical report F and Chapter 12 *Noise and vibration*
- Technical report J and Chapter 14 *Landscape and visual*
- Technical report K and Chapter 15 *Land use*
- Technical report L and Chapter 16 *Social*.

### What is terrestrial flora and fauna?

Terrestrial flora and fauna are plants and animals that inhabit dry land. For example, Spiny Rice-flower and Striped Legless Lizard. For this Project, amphibians are considered as terrestrial fauna, while platypus and turtles are considered as aquatic fauna.

### What is aquatic fauna?

Aquatic fauna are animals that live in water for most or all of their lifetime. For example, Australian Grayling.

## 7.2 Method

The biodiversity assessment involved the following key tasks:

- Review of relevant Commonwealth and Victorian legislation and policy and local government law
- Establishment of a study area for biodiversity and habitats. For terrestrial flora and fauna the study area was defined as all land within five kilometres of the construction corridor, as shown in Figure 7-1. For aquatic fauna the study area included the entire length of Deep Creek, Jacksons Creek and Merri Creek to the confluence of the Yarra River with a one-kilometre buffer from streams
- Desktop assessment and baseline data reviews of biodiversity within the study area to identify biodiversity values and to inform targeted surveys to extend the understanding of the study area. This assessment included a review of publicly available reports of previous environmental studies by public or private entities
- Field surveys to provide descriptions and quantification of native vegetation, terrestrial fauna habitat, threatened fauna habitat assessments and targeted surveys for threatened flora and ecological communities
- Consultation with the Victorian Department for Environment Land, Water and Planning (DELWP) and the Australian Department of Agriculture, Water and Environment (DAWE), specialist attendance at community information sessions, and review of feedback received in APA's broader consultation program

### What is the Study Area?

The Study Area refers to a broader region surrounding the construction corridor (that is, includes areas that are outside the proposed impact areas). The Study Area for this assessment includes all land within five kilometres of the construction corridor. This description covers a much broader area than the expected zone of impact and the additional information captured has been used to provide context to determine the significance of ecological features identified within the construction corridor.

### What is the construction corridor?

The construction corridor includes the full extent of both the construction and operation corridors. Any tracks and turn-around bays required during construction are included as part of the construction corridor. The permanent easement corridor for the operation phase is a narrower corridor (mostly 15 m) within the construction corridor area.

### Threatened flora and fauna

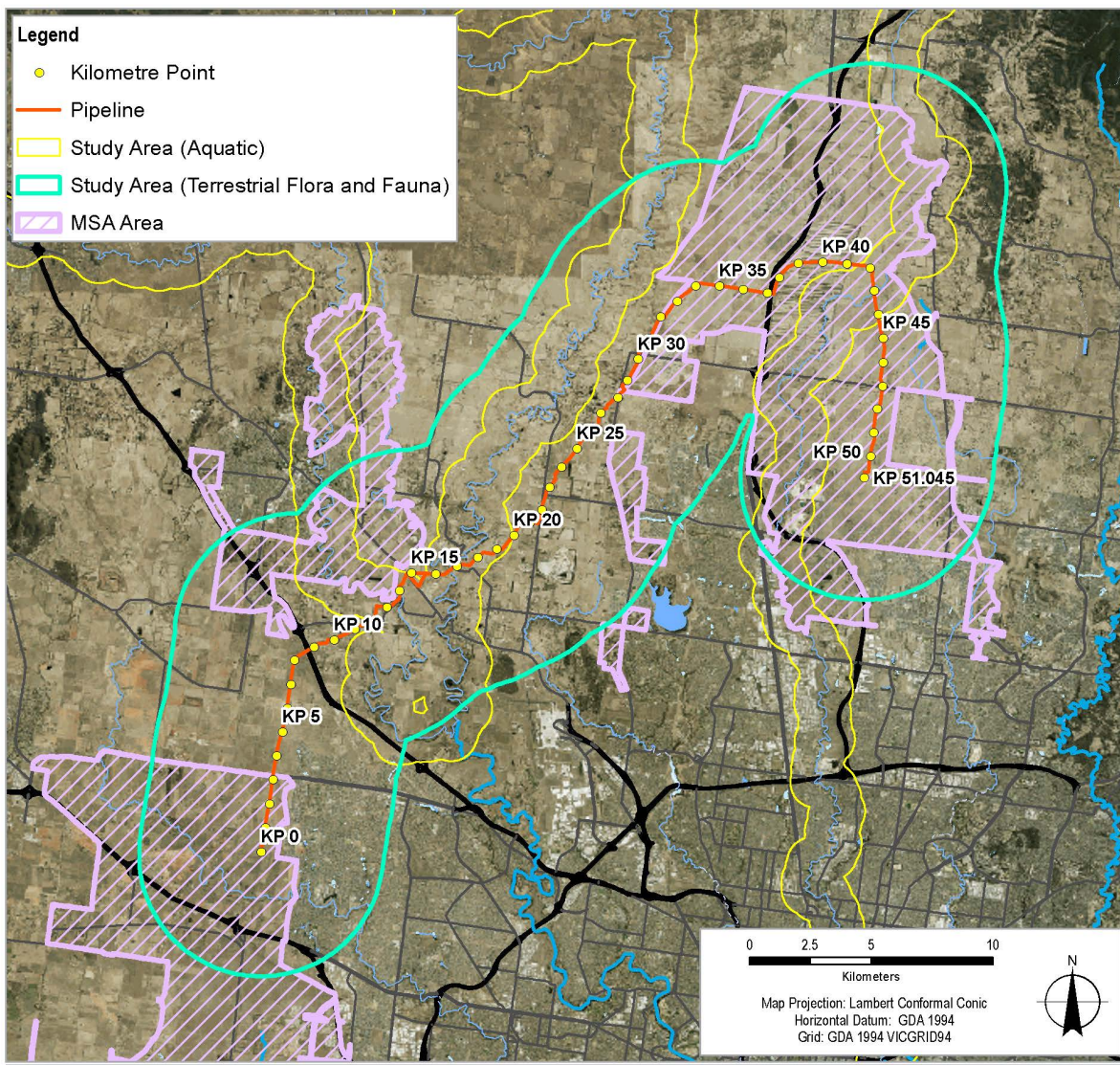
Threatened flora and fauna refers to flora and fauna that is listed under the following:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): The EPBC Act is Australia's key Commonwealth legislation for the protection of threatened species and ecological communities
- *Flora and Fauna Guarantee Act 1988* (FFG Act): The FFG Act is Victoria's key legislation for the conservation of Victoria's native species. The Act establishes a threatened species list, a protected species list and a list of threatened "communities of flora and fauna", to identify those species and communities that require management to conserve. Species that are listed under the FFG Act are considered threatened for the purpose of this assessment. Species that are protected are not considered threatened, but require a permit to remove
- Department of Environment, Land, Water and Planning (DELWP) threatened species advisory list: The advisory list has no legal status, but may be considered in planning assessments and for the purposes of vegetation removal offsets.

- A risk-based review of potential impacts using biodiversity risk assessment criteria to prioritise the focus of the impact assessment
- Assessment of the potential impacts on biodiversity and habitats during construction and operation of the Project, prior to any mitigation measures. Biodiversity technical methods were used to quantify the impacts that could produce a loss, reduction or reduced viability of specific biodiversity values, as a result of the construction and operation of the Project

- Assessment of mitigation options and development of environmental management measures (EMMs) in response to the impact assessment to avoid and/or minimise impacts. Refer to Chapter 19 *Environmental management framework* for the full list of environmental management measures
- Assessment of the residual impacts of the Project assuming implementation of the environmental management measures
- Specifying the monitoring required to evaluate whether the Project meets the environmental management measures and detailing contingency measures as required.

Figure 7-1 Biodiversity study area



Data source: APA, 2020; GHD, 2020; DELWP, Vicmap, 2020 Created by kgardner

## 7.3 Existing conditions

The following section outlines the existing conditions of the Project study area in relation to biodiversity and habitats.

The Project is located within the Port Phillip Basin and traverses sections of the Werribee River, Yarra River and Maribyrnong River catchments. It spans the Victorian Volcanic Plain bioregion and a small area of the Central Victorian Uplands bioregion. Landscapes within the Project study area are highly modified by past land use including agricultural, infrastructure and urban development.

The existing conditions in relation to biodiversity are discussed with reference to the different approvals affecting those areas:

- Within the Melbourne Strategic Assessment approved areas (KP 0 – KP 3.15 and KP 28.16 – KP 28.57 and KP 32.07 – KP 51.04)
- Outside the Melbourne Strategic Assessment approved areas (KP 3.15 – KP 28.16 and KP 28.57 – KP 32.07).

### What the MSA?

The Melbourne Strategic Assessment (MSA) is an agreement between the Victorian and Australian governments made under Part 10 of the EPBC Act whereby impacts on MNES that are expected to occur within the Melbourne urban growth boundary are defined and accounted for and can be considered early in the development of a plan, policy or program.

The environmental mitigation levies set out in the MSA Levy Act are used to determine levies to fund measures to mitigate impacts on biodiversity caused by the development of land in Melbourne's growth corridors.

The areas covered under this approval are referred to for this Project as the "approved MSA areas" and include the sections between approximately KP 0 to KP 3.2 and KP 28.16 – KP 28.57 and KP 32.07 – KP 51.04.

Areas outside of the MSA occur approximately between KP 3.15 – KP 28.16 and KP 28.57 – KP 32.07 and require approvals under the EPBC Act.

The existing conditions in relation to biodiversity for the study area are described below in respect to each value: flora, fauna and aquatic.

### 7.3.1 Botanical values

#### Vegetation

Native vegetation within the construction corridor is generally degraded and fragmented, reflecting the area's long history of agricultural land use, and more recently urban development. For the most part, vegetation is dominated by pasture grasses and in some areas, extensive tracts of noxious weeds. Shelterbelts and windbreaks are common and mostly consist of species that are not indigenous to Victoria.

Native vegetation mapped within the construction corridor consists of scattered native trees, remnant grassy woodland and grassland on private property and along public road reserves within and outside the MSA area. Most native vegetation occurs outside the MSA area.

### What is native vegetation?

Native vegetation is defined in Victoria Planning Provision Clause 72 as "plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses". In the case of the Project, this includes vegetation that is native to the Port Phillip and Westernport Catchment Management Region.

### What is an EVC?

The Ecological Vegetation Class (EVC) is a type of native vegetation classification specific to Victoria that is described through a combination of floristics, lifeforms and ecological characteristics and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities that occurs across a biogeographic range, and although differing in species, have similar habitat and ecological processes.

Database searches identified the potential for seven EVCs in the Victorian Volcanic Plains (VVP) and nine EVCs in the Central Victorian Uplands (CVU) bioregions with a bioregional conservation status of endangered to be present within the study area. Two EVCs were recorded in the CVU and six in the VVP during fieldwork (Table 7-1).

Table 7-1 Summary of EVCs mapped in the construction corridor

Ecological Vegetation Class	EVC number	Bioregional Conservation Status
<b>Central Victorian Uplands</b>		
Plains Grassland	132	Endangered
Riparian Woodland	641	Endangered
<b>Victorian Volcanic Plain</b>		
Plains Grassland	132	Endangered
Plains Grassy Woodland	55	Endangered
Plains Grassy Wetland	125	Endangered
Riparian Woodland	641	Endangered
Stony Knoll Shrubland	649	Endangered
Aquatic Herbland	653	Endangered

In total 15.32 hectares of native vegetation was mapped between 2019 and 2020 within the construction corridor (Figure 7-4). Within this mapped vegetation a total of 141 flora (86 native, 55 introduced) were recorded.

The extent of native vegetation patches surveyed outside the MSA area was 13.39 hectares and ranged in condition from low to moderate. Native canopy trees were recorded as both scattered trees and as canopy trees within native vegetation patches. A total of 32 scattered trees (16 large and 16 small) and 12 large canopy trees were recorded within the entire construction corridor.

Within the approved MSA areas, DELWP's time-stamped dataset identified vegetation with condition scores from 0.11 to 0.6. Field survey scores for patches inside the MSA areas ranged from 0.17 to 0.42.

Remnant vegetation generally consists of grassland and grassy woodland associated with basaltic soils of the VVP (Figure 7-2). Some patches of Plains Grassland or Plains Grassy Woodland were also recorded, which also meet condition thresholds for EPBC Act-listed communities Natural Temperate Grassland of the Victorian Volcanic Plain and Grassy Eucalypt Woodland of the Victorian Volcanic Plain.

### What is a large tree?

A large tree is a native tree with a diameter at breast height (DBH) greater than or equal to the large tree benchmark for the relevant bioregional EVC.

A large tree can either be a large scattered tree (a tree that does not form part of a patch) or a large canopy tree within a patch of native vegetation.

Trees with potential for loss are assessed either as a direct loss within the construction corridor or indirectly lost due to encroachment of the construction corridor into the Tree Protection Zone (TPZ). A tree is deemed indirectly lost if encroachment into the TPZ area is greater than 10 per cent (DELWP, 2018).

### What is a patch?

A patch of native vegetation in Victoria is defined by DELWP as:

"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 drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy" (DELWP, 2017a pp. 6).

### What is a scattered tree?

A scattered tree is a native canopy tree that does not form part of a patch (DELWP, 2017a pp. 6).

Riparian Woodland (EVC 641) was mapped at each of the three major stream crossings (Deep Creek, Jacksons Creek and Merri Creek). These riparian corridors along the three waterways provide the most contiguous areas of native vegetation (Figure 7-3). Large trees, which provide important habitat value, were also recorded in all three Riparian Woodland patches.

*Figure 7-2 Plains Grassy Woodland/Grassy Eucalypt Woodland of the Victorian Volcanic Plain on private property. Photo: GHD 2020*



*Figure 7-3 Riparian Woodland at Jacksons Creek: overhanging trees (left). Photo: GHD 2020*



## Wetlands

Four mapped wetlands<sup>1</sup> consisting of Plains Grassy Wetland and Plains Grassland EVCs were identified within the construction corridor. These include:

- KP 41 – Part of a single mapped wetland partially within the construction corridor and within approved MSA area
- KP 44-45 – Three small wetlands, two of which are partially within the construction corridor and are within the approved MSA area.

The four mapped wetlands were dry at the time of the 2019 botanical surveys and could not be accurately assessed in the field, due to insufficient rainfall. Therefore, modelled condition scores were incorporated into the assessment of native vegetation removal, as per the guidelines<sup>2</sup>. None of the mapped wetlands provided any biotic indication that they were wetlands.

### What is a mapped wetland?

A mapped wetland is determined by DELWP and presented as the “current wetland layer” in DELWP’s Native Vegetation Information Management system (NVIM). Mapped wetlands are considered as a remnant patch, and must be included in the extent of native vegetation removal. The modelled condition score, provided by DELWP, is assigned to these wetlands.

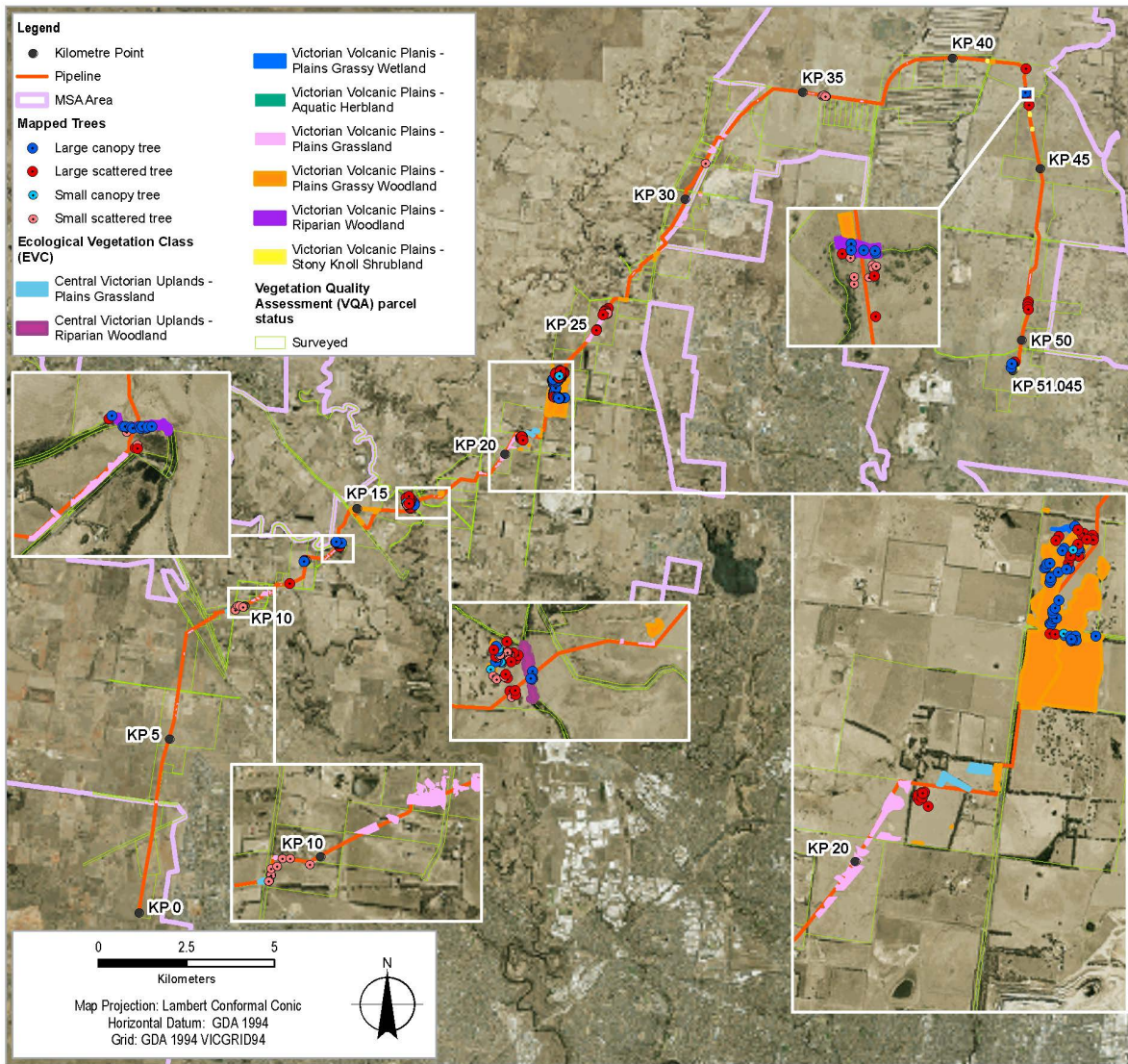
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<sup>1</sup> Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017a); Assessors handbook – Application to remove, destroy or lop native vegetation (DELWP, 2018).

<sup>2</sup> Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017a).



Figure 7-4 Mapped native vegetation within Project corridor



## Groundwater Dependant Ecosystems

Groundwater underlying the study area within the Kororoit Creek catchment was estimated to be greater than five metres deep. The water table depth in the Maribyrrnong catchment segment of the study area exceeds 10 metres, except for the Jacksons Creek and Deep Creek crossings, both of which are gaining streams. No groundwater discharge areas were observed in the section of the study area within the Kororoit Creek catchment, nor were GDEs observed in that section, other than at the Jacksons Creek and Deep Creek crossings where a Riparian Woodland GDE was mapped.

### What are Groundwater Dependend Ecosystems?

Groundwater Dependend Ecosystems (GDEs) are complex, dynamic ecosystems that rely on groundwater contribution on a permanent or intermittent basis to sustain their ecological functions, provide ecosystem services and maintain flora and fauna communities with requirements for specific watering regimes. GDEs include ecosystems that depend on the surface expression of groundwater, the subsurface presence of groundwater, or reside within a groundwater resource.

No groundwater seeps were observed in the Merri Creek catchment, with no observations of any instances of salt tolerant wetland or other swamp vegetation within the study area that would correspond with such seeps.

A summary of identified and potential GDEs of relevance to the Project are included in Table 7-2.

Table 7-2 Summary of identified and potential GDEs

Approximate kilometre point (km)	Description
KP0 – KP5	Scattered wetlands (aquatic GDEs) away from the alignment.
KP5 – KP7, KP8 – KP9	Scattered modelled GDEs.
KP10 – KP11	Potential aquatic GDE associated with Jacksons Creek tributary and uncultivated grassland.
KP13 – KP14	Jacksons Creek – potential terrestrial and aquatic GDEs.
KP15 – KP 24, KP26 – KP27	Deep Creek – potential terrestrial and aquatic GDEs. Potential terrestrial GDE along the alignment between Deep Creek and Oaklands Road and scattered potential GDEs between KP25 and KP30. Low potential aquatic GDE west of the alignment, between approximately KP25 and KP30.
KP30 – KP31	Potential terrestrial GDE.
KP34 – KP35 KP35 – KP37	Kalkallo Creek; potential aquatic GDE. A large potential GDE has been mapped immediately north of the alignment adjacent Kalkallo Creek.
KP38 – KP39	Potential terrestrial GDE.
KP43	Merri Creek. Potential aquatic GDE.

## Threatened flora

### EPBC Act and FFG Act threatened flora

Desktop assessments indicated that suitable habitat for 19 species listed under the EPBC Act, as well as 30 species listed under the FFG Act, may occur within the study area (Table 7-3).

Table 7-3 EPBC Act and FFG Act-listed species recorded within five kilometres of the construction corridor

VU/v – vulnerable; EN/e – endangered; CR – critically endangered; L – listed as threatened

Scientific Name	Common Name	EPBC Act	FFG Act	PMST*
<i>Allocasuarina luehmannii</i>	Buloke	--	L	-
<i>Amphibromus pithogastrus</i>	Plump Swamp Wallaby-grass	-	L	-
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	VU	-	-
<i>Atriplex billardiarei</i>	Glistening Saltbush	-	L	-
<i>Calotis anthemoides</i>	Cut-leaf Burr-daisy	-	L	-
<i>Carex tasmanica</i>	Curly Sedge	-	L	-
<i>Comesperma polygaloides</i>	Small Milkwort	-	L	-
<i>Cullen parvum</i>	Small Scurf-pea	-	L	-
<i>Cullen tenax</i>	Tough Scurf-pea	-	L	-
<i>Dianella amoena</i>	Matted Flax-lily	EN	L	-
<i>Diuris basaltica</i>	Small Golden Moths	EN	L	-
<i>Diuris fragrantissima</i>	Sunshine Diuris	EN	L	-
<i>Diuris palustris</i>	Swamp Diuris	-	L	-
<i>Diuris punctata</i>	Purple Diuris	-	L	-
<i>Dodonaea procumbens</i>	Trailing Hop-bush	VU	-	-
<i>Geranium</i> sp. 1	Large-flower Crane's-bill	-	L	-
<i>Glycine latrobeana</i>	Clover Glycine	VU	L	-
<i>Goodenia macbarronii</i>	Narrow Goodenia	-	L	-
<i>Lachnagrostis adamsonii</i>	Adamson's Blown-grass	EN	L	-
<i>Leiocarpa leptolepis</i>	Pale Plover-daisy	-	L	-
<i>Lepidium hyssopifolium</i> s.s.	Basalt Peppercross	EN	L	-
<i>Leucochrysum albicans</i> subsp. <i>tricolor</i>	Hoary Sunray	EN	L	-
<i>Lindsaea trichomanoides</i>	Oval Wedge-fern	-	L	-
<i>Pimelea spinescens</i> subsp. <i>spinescens</i>	Spiny Rice-flower	CR	L	-
<i>Pomaderris vacciniifolia</i>	Round-leaf Pomaderris	CR	L	-
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	EN	L	-
<i>Pterostylis chlorogramma</i>	Green-striped Greenhood	VU	L	-
<i>Pterostylis cucullata</i>	Leafy Greenhood	VU	L	-

Scientific Name	Common Name	EPBC Act	FFG Act	PMST*
<i>Rutidosia leptorhynchoides</i>	Button Wrinklewort	EN	L	-
<i>Senecio macrocarpus</i>	Large-headed Fireweed	VU	L	-
<i>Senecio psilocarpus</i>	Swamp Fireweed	VU	-	-
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU	L	-
<i>Xerochrysum palustre</i>	Swamp Everlasting	VU	L	-

\*PMST – Protected Matters Search Tool

Targeted field surveys for EPBC Act and FFG Act species predicted to occur within the study area determined that an extremely low number of threatened flora were present. This is evident in the case of the Spiny Rice-flower where both Biosis and GHD consider that few parcels within the construction corridor contained suitable habitat for Spiny Rice-flower. Regardless, survey effort was increased by spacing transects 2.5 metres apart. VQA surveys were conducted in conjunction with targeted flora surveys and no plants in the *Pimelea* genus were detected either during targeted surveys or during vegetation assessments, regardless of the season (refer to Appendix C of Technical report A *Biodiversity and habitats* for further detail on the flora recorded within the construction corridor).

Two species were recorded during the targeted surveys. These were:

- A single Matted Flax-lily (*Dianella amoena*) (listed as EPBC Act Endangered, FFG Act Listed and DELWP advisory endangered) individual was identified within the fence line along an uncultivated area of roadside at KP 22.7, adjacent to a paddock of Plains Grassy Woodland between KP 23 and KP 24. The Matted Flax-lily recorded is on public land outside the MSA area
- The Tough Scurf-pea (*Cullen tenax*) (listed as FFG Act Threatened and DELWP advisory endangered) was recorded on private land within the MSA area. A total of 48 individuals were recorded in one patch.

No other EPBC Act or FFG Act-listed flora were recorded during the field assessments.

## Victorian Threatened flora

Desktop assessments indicated 26 species of flora considered threatened in Victoria by DELWP have been recorded within the study area. These records include two species listed under the EPBC Act, 14 species listed under the FFG Act and 26 species considered rare or threatened in Victoria<sup>3</sup> (Table 7-4). In most cases, EPBC Act and FFG Act-listed species are also listed under DELWP's advisory list.

<sup>3</sup> Advisory List of Rare or Threatened Plants in Victoria – 2014 (DEPI, 2014).

Table 7-4 DELWP advisory list threatened species recorded within five kilometres of the construction corridor

v – vulnerable; EN/e – endangered; L – listed as threatened; VICADV – DEPI (2014)

Scientific name	Common name	EPBC	VICADV	FFG
<i>Allocasuarina luehmannii</i>	Buloke	-	e	L
<i>Amphibromus pithogastrus</i>	Plump Swamp Wallaby-grass	-	e	L
<i>Carex tasmanica</i>	Curly Sedge	-	v	L
<i>Chloris ventricosa</i>	Plump Windmill Grass	-	v	-
<i>Comesperma polygaloides</i>	Small Milkwort	-	v	L
<i>Coronidium gunnianum</i>	Pale Swamp Everlasting	-	v	-
<i>Cullen parvum</i>	Small Scurf-pea	-	e	L
<i>Cullen tenax</i>	Tough Scurf-pea	-	e	L
<i>Dianella amoena</i>	Matted Flax-lily	EN	e	L
<i>Dianella longifolia</i> var. <i>grandis</i>	Arching Flax-lily	-	v	-
<i>Diuris fragrantissima</i>	Sunshine Diuris	EN	e	L
<i>Diuris palustris</i>	Swamp Diuris	-	v	L
<i>Diuris punctata</i>	Purple Diuris	-	v	L
<i>Eleocharis plana</i>	Flat Spike-sedge	-	v	-
<i>Eucalyptus leucoxydon</i> subsp. <i>connata</i>	Melbourne Yellow-gum	-	v	-
<i>Eucalyptus X studleyensis</i>	Studley Park Gum	-	e	-
<i>Geranium solanderi</i> var. <i>solanderi</i> s.s.	Austral Crane's-bill	-	v	-
<i>Geranium</i> sp. 1	Large- flower Crane's-bill	-	e	L
<i>Goodenia macbarronii</i>	Narrow Goodenia	-	v	L
<i>Leiocarpa leptolepis</i>	Pale Plover-daisy	-	e	L
<i>Lepidium hyssopifolium</i> s.s.	Basalt Peppercross	EN	e	L
<i>Lindsaea trichomanoides</i>	Oval Wedge-fern	-	e	L
<i>Microseris scapigera</i> s.s.	Plains Yam-daisy	-	v	-
<i>Podolepis linearifolia</i>	Basalt Podolepis	-	e	-
<i>Prasophyllum pyriforme</i> s.s.	Silurian Leek-orchid	-	e	-
<i>Pterostylis pedoglossa</i>	Prawn Greenhood	-	v	-

Very few threatened flora were recorded during field surveys. In total, three DELWP Advisory-listed species were recorded:

- Arching Flax-lily (*Dianella longifolia* var. *grandis*, vulnerable) – one individual. The Arching Flax-lily individual occurs on private land outside the MSA area
- Matted Flax-lily (*Dianella amoena*, endangered) – one individual (as above)
- Tough Scurf-pea (*Cullen tenax*, endangered) – 48 individuals (as above).

## EPBC Act-listed threatened ecological communities

A desktop review of the Commonwealth Government's Protected Matters Search Tool identified four listed threatened ecological communities that may occur or are likely to occur within the study area. During the field assessments two EPBC Act threatened ecological communities were recorded:

- Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) is listed as Critically Endangered
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVP) is listed as Critically Endangered.

### What is a Threatened Ecological Community?

An ecological community becomes threatened when it is at risk of extinction. That is, the natural composition and function of the ecological community have been significantly depleted across its full range. Because of threats like land clearing, many ecological communities in Australia have undergone, and continue to be affected by, a rapid and significant reduction in geographic distribution and/or ecological function.

## FFG Act-listed threatened communities

Two FFG Act-listed threatened communities were mapped within the construction corridor. The removal of these communities will require a permit under the FFG Act for vegetation on public land. The two FFG Act-listed threatened communities were:

- Western (Basalt) Plains Grasslands Community, which was the more widespread of the two communities
- Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland.

## Noxious weeds

The construction corridor and surrounding area has generally high levels of weed infestation, including widespread populations of CaLP Act-listed noxious weeds and Weeds of National Significance (WoNS). A total of 11 CaLP Act-listed noxious weed species were recorded during the field assessments, as summarised in Table 7-5. The noxious weeds identified are either a Regionally Controlled, Restricted or Prohibited species under the CaLP Act. Both Serrated Tussock and Artichoke Thistle are widely spread across the construction corridor. The presence of State Prohibited Lobed Needle-grass species was confined to the area surrounding the Wollert Compressor Station.

### What is CaLP Act-listed noxious weeds?

The *Catchment and Land Protection Act 1994* (CaLP Act) establishes a framework for management and protection of catchments through the management of land and water resources. The CaLP Act is the principal legislation relating to the management of pest plants and animals in Victoria.

Noxious weeds can cause environmental or economic harm and are listed depending on their invasiveness and their management requirements.

Table 7-5 Noxious weeds listed under the CaLP Act recorded in the construction corridor

Scientific name	Common name	Status
<i>Chrysanthemoides monilifera</i>	Boneseed	Regionally Controlled
<i>Cirsium vulgare</i>	Spear Thistle	Regionally Controlled
<i>Cynara cardunculus subsp. flavescens</i>	Artichoke Thistle	Regionally Controlled
<i>Lycium ferocissimum</i>	African Box-thorn	Regionally Controlled
<i>Marrubium vulgare</i>	Horehound	Regionally Controlled
<i>Nassella charruana</i>	Lobed Needle-grass	State Prohibited
<i>Nassella neesiana</i>	Chilean Needle-grass	Restricted
<i>Nassella trichotoma</i>	Serrated Tussock	Regionally Controlled
<i>Opuntia spp.</i>	Prickly Pear	Restricted
<i>Rosa rubiginosa</i>	Sweet Briar	Regionally Controlled
<i>Ulex europaeus</i>	Gorse	Regionally Controlled

Figure 7-5 Artichoke Thistle and Serrated Tussock



Source: GHD 2020

## 7.3.2 Fauna

### Fauna habitat

Although habitats in the construction corridor are typically degraded and fragmented, threatened plants and animals can and do persist in the landscape. Areas of potential habitat for significant fauna include forest, grassland and grassy woodland habitat, pasture supporting spear grasses and wallaby grasses, grassland dominated by introduced tussock grasses, scattered indigenous and planted eucalypts within or adjacent to the alignment, wetlands and farm dams within or adjacent to the alignment, and aquatic habitat along Merri Creek, Jacksons Creek and Deep Creek.

#### What is fragmented habitat?

Habitat fragmentation is when large expanses of habitat are disrupted by clearing, land development and infrastructure and the remaining habitat is smaller and isolated from each other.

Overall, the construction corridor is characterised by three main fauna habitat types (grasslands, woodlands and waterways/wetlands). These are described below.

### Grasslands

Much of the construction corridor has been cleared for agricultural purposes. Consequently, the construction corridor is now dominated by grasslands, and mostly non-native grasslands. The condition of the grassland in regard to fauna habitat ranges from very poor to good. Most of the grasslands are dominated by non-native flora species, and show evidence of frequent or occasional disturbance.

Only small patches of grassland within the construction corridor appeared to support high proportions of native flora species and very little unmodified grassland remains in the construction corridor. Typically, many fauna would use native grassland habitat for foraging, breeding and dispersing across the landscape.

As well as supporting a range of common grassland species, sections of this habitat within the construction corridor is known to provide suitable habitat for threatened species including Striped Legless Lizard, Golden Sun Moth and Tussock Skink. Each of these were recorded during targeted assessments.



## Woodlands

Small parts of the construction corridor contain woodland and scattered trees (both native and non-native). In the construction corridor, treed habitats occur mostly along roadways and as wind rows along property boundaries, but also along creeks and in some larger blocks of remnant native woodland habitat.

Woodland occurs as Plains Grassy Woodland and Riparian Woodland EVCs. Riparian Woodland is present at each of the three main waterway crossings. Large trees which provide important habitat value were also recorded in these locations.

Given that a substantially higher proportion of the construction corridor would have supported woodland or grassy woodland habitat prior to European settlement, any remaining woodland now provides important habitat for woodland-dependent fauna, whose habitat has been largely fragmented and isolated.

The condition of woodland within the construction corridor varies widely. Larger patches of remnant woodland are typically of very high quality for woodland fauna and more likely to support threatened fauna (for example, Swift Parrot). Smaller and narrower patches tend to be of medium quality, but still of value for fauna dispersal. Patches of newly-planted or non-native woodland are typically of low value for woodland-dependent fauna.

### What is woodland habitat for fauna?

Native and non-native trees, some of which are hollow-bearing provide foraging, nesting and roosting habitat for fauna. Remaining woodland also provides a network of connectivity for fauna that disperse widely across the landscape (for example, birds, mobile reptiles and mammals).



Photo: GHD 2020

## Waterways and wetlands

Watercourses, waterbodies and their margins often provide important habitat for native fauna and flora. The construction corridor contains suitable wetland habitat for common and threatened species. The construction corridor crosses three main waterways (Jacksons Creek, Deep Creek and Merri Creek) all of which are known to support the threatened Growling Grass Frog.

Waterway and wetland habitat occur both within and outside the MSA area. Within the MSA areas, there are Conservation Areas under the Biodiversity Conservation Strategy established for the protection of Growling Grass Frog, its habitat and to preserve connectivity in this area (between KP 42 and KP 43).

Farm dams assessed were of varying quality with some supporting a high cover of submergent and floating aquatic vegetation through to those that were dry when assessed in the summer of 2019/2020. The majority of dams were considered relatively isolated with a low cover of aquatic vegetation. It is acknowledged that under the right conditions, some of the currently dry wetlands may re-establish. However in the state in which they were initially assessed, most do not offer habitat for many wetland or aquatic fauna. Subsequently, all dams outside the MSA area identified as dry during the summer of 2019/2020 were determined to be wet during November/December 2020.

Some waterways and wetlands are expected to support common frogs and birds and may on rare occasions support threatened frog and bird species.

Habitat assessments were undertaken at 34 waterways or dams as part of the Biosis 2020 and GHD 2020 assessments. The threatened Growling Grass Frog was observed at two locations during site assessments and is discussed below.

### What forms waterway and wetland habitats?

Waterways for the construction corridor include creeks, farm dams and other off-stream waterbodies. The construction corridor crosses three main waterways (Jacksons Creek, Deep Creek and Merri Creek).



Photo: GHD 2020

## Threatened species

A search of the Protected Matters Search Tool (PMST) and Victorian Biodiversity Atlas (VBA) indicated 58 threatened fauna species occur, or are predicted to occur, in the Study Area. These include 23 species (21 threatened species and two migratory species) with a medium or higher likelihood of occurring in the construction corridor (Table 7-6). No listed fauna communities were considered relevant to the construction corridor.

A total of 20 migratory species have been recorded from, or are predicted to occur within, the Study Area. The majority of migratory species are unlikely to make significant use of, or have important habitat within, the construction corridor, with the exception of Latham's Snipe which may visit seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams.

Table 7-6 Terrestrial fauna most likely to occur within the construction corridor (adapted from Biosis 2019, 2020)

Scientific name	Common name	Conservation status			Most recent record <sup>^</sup>	Likelihood to occur within construction corridor	Targeted surveys conducted/recorded during assessment
		EPBC	FFG	DELWP Adv.			
<b>Threatened fauna</b>							
<i>Lathamus discolor</i>	Swift Parrot	CR	L	e	2009	Medium	No/No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU	L	v		High	No/No
<i>Delma impar</i>	Striped Legless Lizard	VU	L	e	2012	High	Yes/Yes
<i>Litoria raniformis</i>	Growling Grass Frog	VU	L	e	2017	High	Yes/Yes
<i>Synemon plana</i>	Golden Sun Moth	CR	L	e	2017	High	Yes/Yes
<i>Hirundapus caudacutus</i>	White-throated Needletail**	VU		v	2014	High	No/No
<i>Egretta garzetta</i>	Little Egret		L	e	1980	Medium	No/No
<i>Stictonetta naevosa</i>	Freckled Duck		L	e	2009	Medium	No/No
<i>Oxyura australis</i>	Blue-billed Duck		L	e	2015	Medium	No/No
<i>Pseudophryne bibronii</i>	Brown Toadlet		L	e	2010	Medium	No/No
<i>Ardea intermedia</i>	Intermediate Egret		L	e	1980	Medium	No/No
<i>Turnix pyrrhoroax</i>	Red-chested Button-quail		L	v	2010	Medium	No/No
<i>Lewinia pectoralis</i>	Lewin's Rail		L	v	1991	Medium	No/No
<i>Porzana pusilla</i>	Baillon's Crake		L	v	2006	Medium	No/No
<i>Falco subniger</i>	Black Falcon		L	v	2007	Medium	No/No
<i>Miniopterus schreibersii oceanensis</i>	Common Bent-wing Bat (eastern ssp.)		L	v	2013	Medium	No/No
<i>Ardea alba modesta</i>	Eastern Great Egret		L	v	2014	High	No/No
<i>Spatula rhynchotis</i>	Australasian Shoveler			v	2005	Medium	No/No
<i>Aythya australis</i>	Hardhead			v	2015	Medium	No/No
<i>Biziura lobata</i>	Musk Duck			v	1996	Medium	No/No
<i>Pseudemoia pagenstecheri</i>	Tussock Skink			v	2016	High	No/Yes
<b>Migratory species</b>							
<i>Gallinago hardwickii</i>	Latham's Snipe				2006	Medium	No/No
<i>Hirundapus caudacutus</i>	White-throated Needletail**	VU		v	2014	High	No/No
<i>Apus pacificus</i>	Fork-tailed Swift				2007	Medium	No/No

\*\* Species listed as threatened and migratory

<sup>^</sup> Most recent record from VBA (does not take into account Biosis 2020 survey results)

Habitat assessments were undertaken to determine the likely presence of species and targeted surveys for selected species were completed where the results could change the understanding of that species at a particular site based on existing information.

Targeted surveys were conducted for Striped Legless Lizard, Golden Sun Moth and Growling Grass Frog. Other species that may also be present (for example, Swift Parrot, Grey-headed Flying-Fox) were not surveyed for and their likelihood of presence was based on incidental observations, desktop data and habitat assessment. For these wide-ranging and highly-mobile species, targeted surveys were considered unlikely to add value to the assessment, because not detecting the species would not provide confidence in a conclusion of absence. Surveys were also not conducted for some species with more localised habitats including Brown Toadlet and Tussock Skink.

While the Brown Toadlet was awarded a medium likelihood of occurrence (based on a historic record) this species was not surveyed for as it is considered possible that this species no longer persists in Greater Melbourne. Tussock Skink records indicate it was already known from the area so presence can be presumed; this was confirmed through Striped Legless Lizard surveys.

A summary of the results of the threatened species' habitat assessment and targeted surveys are shown in Table 7-7. Four threatened species were recorded during targeted surveys: Striped Legless Lizard, Golden Sun Moth, Growling Grass Frog and Tussock Skink. Full survey results and weather conditions are provided in Technical report A - *Biodiversity and habitats*.

Table 7-7 Summary of results of threatened terrestrial fauna targeted surveys

Locations surveyed	Survey effort	Survey timing	Number of individuals recorded	Recorded within/ outside MSA area?
<b>Striped Legless Lizard</b>				
Western Section (west of Calder Freeway; KP0 to KP9)	5 tile grids	Grids checked once between 5 September 2019 to 29 November 2019 and fortnightly between December 6 and 19 December 2019.	0	Outside
North-west Section (east of Calder Freeway and west of Hume Freeway; KP9 to KP37)	10 tile grids (stratified)		6 (from 2 grid locations) near KP 10.7	
Northern Section (east of Hume Freeway; KP37 to KP51)	5 tile grids		0	
<b>Golden Sun Moth</b>				
88 parcels	4 surveys; weekly intervals	18 November 2019 to 23 December 2019 and 27 November to 21 January 2021	90 (across 14 parcels from approximately KP 10 to KP 51)	Both
20 parcels	1 – 3 surveys			
1 parcel	Not surveyed (due to access and/or weather)			

Locations surveyed	Survey effort	Survey timing	Number of individuals recorded	Recorded within/ outside MSA area?
<b>Growling Grass Frog</b>				
31 waterbodies (3 streams and 28 dams) within 100 m of construction corridor	Diurnal survey – habitat identification	17 December 2019 to 15 December 2020	1 incidental (Deep Creek – assumed presence) Presence also assumed at Jacksons and Merri Creeks	Both
19 waterbodies (18 dams and 1 waterway)	2 Nocturnal surveys		Multiple Growling Grass Frogs recorded in 1 dam near KP 40 (5 adults and 3 metamorphs) approximately 100 m from construction corridor	
<b>Tussock Skink</b>				
Incidental observations during Striped Legless Lizard tile surveys (see Striped Legless Lizard locations)	20 grids	See Striped Legless Lizard	93 records (across 10 grids)	Both

## EPBC Act Matters of national environmental significance-listed threatened fauna

Six EPBC Act threatened species were considered as having a high/medium likelihood of occurring within the construction corridor. Their potential to be present and the results of targeted surveys are described below.

### Swift Parrot, *Lathamus discolor* (EPBC, critically endangered; FFG, Listed; DELWP, endangered)

This species was not detected during the assessment. Targeted surveys for this species in the construction corridor were not done, due to the low likelihood of detecting the species, and the fact that not detecting the species would not increase confidence in a conclusion that the species is absent. Additionally, habitat assessment can be used to predict the importance of feeding habitat (Biosis, 2020).

Through desktop investigations and field habitat assessments, it was determined that the Swift Parrot has the potential to make occasional use of scattered indigenous or planted eucalypts within or adjacent to the construction corridor on rare occasions, including favoured food trees Grey Box, Yellow Box and Yellow Gum which are present in the construction corridor, though River Red-gum was most prevalent. The Project is unlikely to pose a significant risk to the species and the construction corridor does not constitute critical habitat (Biosis, 2020).

### Grey-headed Flying-fox, *Pteropus poliocephalus* (EPBC, vulnerable; FFG, Listed; DELWP, vulnerable)

Roosts (camps) in the Melbourne area are well-documented and it is unlikely that any occur within or near the construction corridor. Survey for the species was not considered necessary as an assessment of vegetation can be used to predict and rank the importance of feeding habitat. While the species has not been recorded within construction corridor (VBA), the species may use flowering indigenous and planted trees within or adjacent to the construction corridor for foraging (Biosis, 2020).

The vegetation within the construction corridor is not considered to constitute important or limiting habitat for the species and the Project works are considered highly unlikely to have a significant impact on this highly mobile species (Biosis, 2020).

### Striped Legless Lizard, *Delma impar* (EPBC, vulnerable; FFG, Listed; DELWP, vulnerable)

The construction corridor contains some areas of vegetation (habitat) considered to have a high likelihood of supporting Striped Legless Lizard populations through to areas with a low likelihood of supporting the species (Biosis, 2020).

Targeted surveys comprising of tile grid surveys were undertaken (Biosis, 2020), focusing on areas of native grassland and to a lesser extent exotic grassland that contained appropriate habitat structure (tussock grasses, embedded and surface rock). No sampling was undertaken in areas of habitat considered unlikely to support the species (land subject to historic and/or ongoing ground disturbance).

Striped legless lizards were recorded in two of the 20 grids deployed across the construction corridor within one parcel at approximately KP 10.7, outside the MSA area. The population found is considered a significant population<sup>4</sup>. Figure 7-6 provides an overview of Striped Legless Lizard survey results.

Based on the results of the targeted surveys, all patches of native and non-native vegetation within the construction corridor in that one parcel are confirmed habitat. This is in accordance with the Striped Legless Lizard referral guidelines: "If the species is detected during a survey, all potentially suitable habitat at the site should be considered occupied by the species" (Commonwealth of Australia 2011). The native and non-native vegetation in the adjacent parcel that is contiguous and west of this parcel is therefore also considered confirmed habitat. The total area of confirmed Striped Legless Lizard habitat within the construction corridor is 0.67 hectares (Table 7-8).

The highest quality habitat in the construction corridor was sampled and the species was detected at two grids in that area. No Striped Legless Lizard were detected at any of the other 18 tile arrays. While there is some confidence that the species does not occur in any other habitat patches traversed by the construction corridor and in parcels sampled with a tile array, there are numerous parcels that were not surveyed using tile arrays and where there is little context about the residency of the species in the areas immediately adjacent to the construction corridor. The quality of the habitat for much of the area considered as potential habitat is marginal and the likelihood of the species occurring there is considered low.

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<sup>4</sup> Conservation Advice *Delma impar* Striped Legless Lizard (TSSC (2016 pp. 4)).

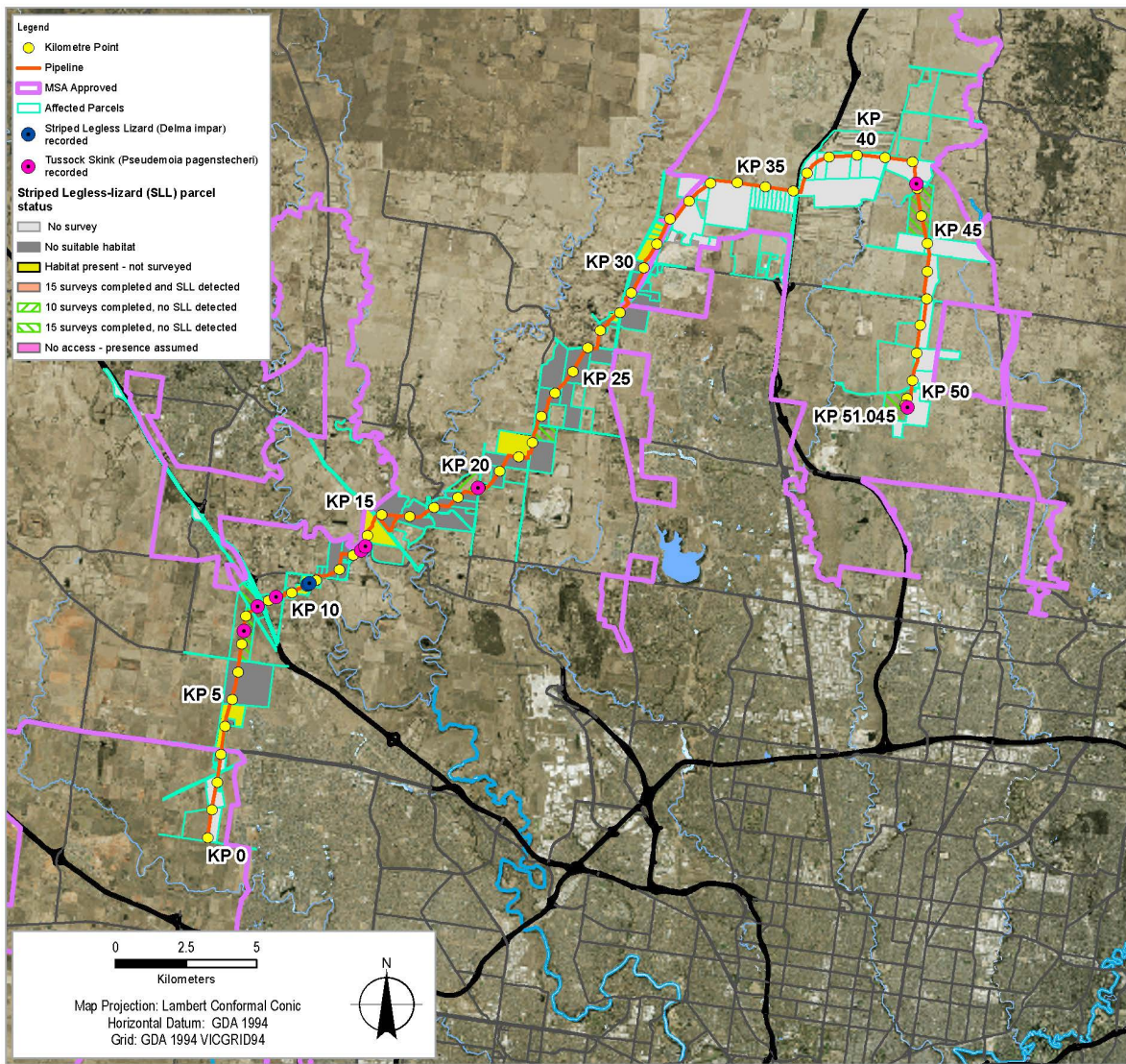
However, following consultation with DELWP, a conservative approach has been adopted where the species is presumed present in all areas containing suitable habitat for the species. This includes areas where targeted surveys have been undertaken and areas where they have not been undertaken. Additionally, one parcel occurs where access was not permitted so the suitability of habitat could not be determined. The Striped Legless Lizard is assumed to be present in this location.

Table 7-8 Extent of assumed Striped Legless Lizard habitat outside the MSA area

Species' habitat presence/absence	Striped Legless Lizard surveys	Construction corridor extent (ha)
Habitat present (habitat where species detected)	15 surveys completed – species detected (12LP92520)	0.49
Habitat assumed (potential habitat where species assumed to be present)	Parcel adjacent confirmed habitat (11LP92520)	0.18
	No access to assess habitat (4LP126752)	1.0
	15 surveys completed – species not detected	14.73
	10 surveys completed – species not detected	2.17
	Habitat present – not surveyed	20.74
Total area considered habitat		39.34
Habitat absent (no suitable habitat)	No surveys	50.39
Total area not considered habitat		50.39
Total construction corridor outside MSA		89.73

*\*Note: this extent does not exactly equal the total extent of the current construction corridor (89.68 ha outside of the MSA) due to minor overlap in parcel boundaries.*

Figure 7-6 Survey results for Striped Legless Lizard



### Growing Grass Frog, *Litoria raniformis* (EPBC, vulnerable; FFG, Listed; DELWP, vulnerable)

Habitat suitable for this species was identified from a combination of desktop information and onsite rapid assessments. A total of 12 waterbodies (outside the MSA area) identified as potential Growing Grass Frog habitat were dry during initial inspection and were not subject to targeted survey (Biosis, 2020). A total of eight waterbodies were found to contain water and at least some habitat attributes known to be positively associated with occupancy by Growing Grass Frog at the time of assessment and warranted a targeted survey (Biosis 2020).



Rainfall was higher leading up to the 2020 breeding season for the species and subsequent habitat assessments found that 10 of the 12 waterbodies contained water during November and December 2020 habitat assessments. The remaining two waterbodies could not be accessed but were assumed to also contain water. Subsequently, those waterbodies that were expected to be directly impacted were subject to nocturnal survey.

Growling Grass Frogs were recorded within Deep Creek and also within an offline waterbody within the MSA area near KP 40. The presence of multiple individuals, including metamorphlings, indicates this waterbody is a breeding site. Growling Grass Frogs have been previously recorded from the three major streams (Jacksons, Deep and Merri creeks) crossed by the construction corridor. Consequently Jacksons and Merri Creeks were not surveyed and presence of Growling Grass Frogs at these waterways is assumed.

Growling Grass Frog surveys were undertaken over two nights at 19 locations outside the MSA area though no individuals were detected. The species is known or assumed to be present at only two locations outside the MSA area: Deep Creek and Jacksons Creek.

Growling Grass Frogs were not recorded in any offline waterbodies outside the approved MSA areas surveyed during the 2019/20 or 2020 active season. Most of the dams surveyed were considered to have a low probability of supporting the Growling Grass Frog due to their relative isolation (distance to known Growling Grass Frog populations) and low proportional cover of aquatic vegetation.

The significant impact guidelines for the species<sup>5</sup> defines that any populations that occur at the two locations outside the MSA areas would be considered important.

### Golden Sun Moth *Synemon plana* (EPBC, critically endangered; FFG, Listed; DELWP, vulnerable)

The Golden Sun Moth is currently listed as critically endangered. The Golden Sun Moth is currently being assessed by the Threatened Species Scientific Committee to be eligible for listing as Vulnerable largely driven by the increase in extent of occurrence and area of occupancy since it was first listed. This document is still in under review, consequently significant impacts to the Golden Sun Moth are considered against the thresholds outlined within the Significant impact guidelines for the species.

Areas within the construction corridor that still support native grassland, and/or non-native grassland that is grazed without a recent history of cropping, have the potential to support this species. Overall, 111 parcels were identified as containing potentially suitable habitat. The completeness of these surveys was constrained by access restrictions and weather constraints, however, the following surveys were undertaken:

- Four rounds of surveys in 88 parcels
- One to three rounds of surveys in 20 parcels (of which 13 are within the MSA)
- No surveys in one parcel.

Golden Sun Moths were detected within the construction corridor in 14 parcels and seven of these parcels lie within the MSA areas. Two parcels where Golden Sun Moths were recorded have contiguous suitable habitat both within and outside the MSA areas.

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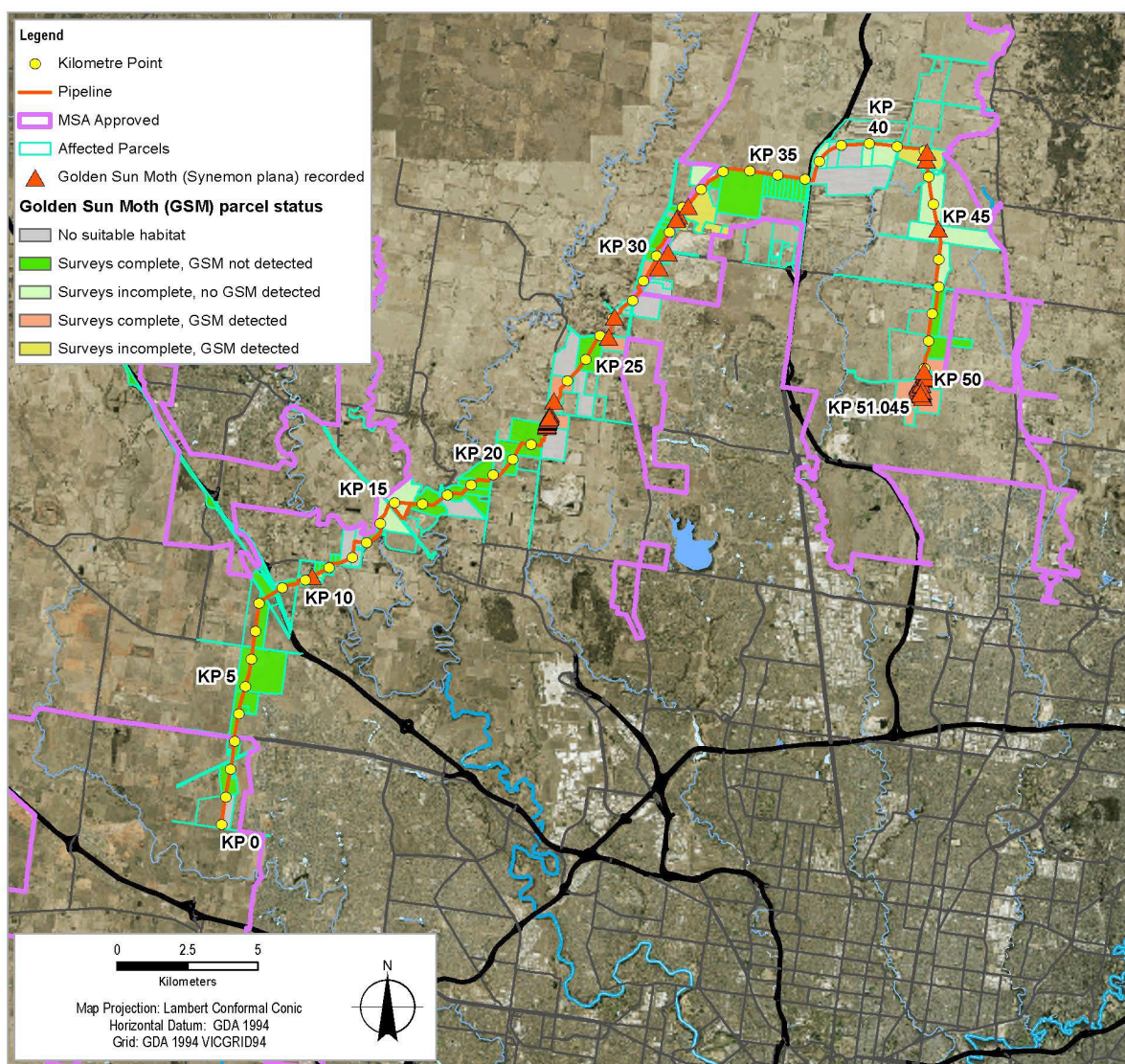
<sup>5</sup> Significant impact guidelines for the vulnerable growling grass frog (*Litoria raniformis*) (DEWHA 2009c).

Where four valid surveys were conducted with no moths found, the species is considered absent for the purposes of this assessment<sup>6</sup>. Based on the results of the 2019/20 and 2020/21 surveys, Golden Sun Moth is considered absent from 88 parcels within the construction corridor. This is in addition to 24 parcels which were not surveyed due to lack of suitable habitat for the species.

A total of 90 Golden Sun Moths were recorded in areas within and outside of the MSA areas from approximately KP 10 through to KP 51.

Based on the survey data collected to date, the current estimate of confirmed Golden Sun Moth habitat (inclusive of areas where Golden Sun Moth were detected during targeted surveys and where habitat was identified and targeted surveys remain incomplete) within the construction corridor outside the MSA area is approximately 19.93 hectares (Figure 7-7 and Table 7-9).

Figure 7-7 Survey results for Golden Sun Moth



<sup>6</sup> Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*) (DEWHA, 2009b).

Table 7-9 Extent of assumed Golden Sun Moth habitat outside the MSA area

Species/habitat presence/absence	Golden Sun Moth surveys	Extent (ha)
Known habitat – species present	Surveys completed – species detected	11.05
	Surveys incomplete – species detected	0.80
Potential habitat – species assumed present	Surveys incomplete – species not detected	8.08
<b>Total area considered habitat</b>		<b>19.93</b>
Potential habitat	Surveys completed – species not detected	56.53
No suitable habitat	No surveys	13.13
<b>Total area not considered habitat</b>		<b>69.64</b>

### White-throated Needletail, *Hirundapus caudacutus* (EPBC, vulnerable; DELWP, vulnerable)

The species has previously been recorded within the construction corridor near KP 40.45 within the approved MSA area, though was not detected during field assessments for this Project.

White-throated Needletails are likely to forage occasionally in the airspace of the construction corridor, but unlikely to have a substantial association with the terrestrial habitats. The Project is unlikely to pose a significant risk to the species.

### Other listed species

Four additional EPBC Act-listed species that are considered to have a low likelihood of occurrence have also been discussed as they were identified in the EPBC Act referral decision notice (EPBC Ref. 2019/8569) to “have a real chance or possibility that Project activities will significantly impact” on them. These species are described in Table 7-10.

Table 7-10 Additional EPBC Act-listed species considered

Species	Status	Likelihood of occurrence
Australasian Bittern, <i>Botaurus poiciloptilus</i>	EPBC, endangered; FFG, listed; DELWP, endangered	Field habitat assessment determined that suitable wetland habitat for this species does not occur within the construction corridor. Additionally, the species has not been observed in the construction corridor for more than 30 years, last recorded in 1989 (VBA). It was determined that the likelihood of this species occurring within the construction corridor is low
Grassland Earless Dragon, <i>Tympanocryptis pinguicollis</i>	EPBC, endangered; FFG, listed; DELWP, endangered	This species has previously been recorded in the construction corridor (one record from 1990 near KP 42.6 inside the approved MSA areas; Museum Victoria question the validity. The last confirmed record in Victoria is 1969 <sup>7</sup> ). Extensive surveys have been conducted at this location and the surrounding area to the north and west of Melbourne <sup>8</sup> and the species has not been detected. It is accepted that this species is likely to now be extinct within northern Melbourne and potentially within Victoria <sup>9</sup> . The likelihood of occurrence within the construction corridor or potential for interaction with the Project is considered low.
Painted Honeyeater, <i>Grantiella picta</i>	EPBC, vulnerable; FFG, listed; DELWP, vulnerable	This species is rarely recorded in the Melbourne area and is more typically found in northern Victoria. There is a possibility that this species is a rare visitor to any well-treed areas, though it has never been recorded from within the construction corridor. The likelihood of occurrence within the construction corridor or interaction with the Project is considered low.
Pink-tailed Worm-lizard, <i>Aprasia parapulchella</i>	EPBC, vulnerable; FFG, listed; DELWP, endangered	In Victoria the only known population is around Bendigo. There is a single record of this species approximately 30 km west of the construction corridor near Ballan though this is a known database location error and is actually located at One Tree Hill reserve, Bendigo.  There are no known populations of this species in the Melbourne area. The likelihood of occurrence or potential for interaction with this species resulting from the Project is considered low.

## EPBC Act Matters of National Environmental Significance-listed Migratory species

While some of these species may use or visit habitats within the construction corridor occasionally, the majority of these species are unlikely to make significant use of or have important habitat within the construction corridor, with the exception of Latham’s Snipe which may visit seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams.

### What is listed migratory fauna?

The migratory listing of some Australian fauna under the Commonwealth EPBC Act is intended to protect and conserve habitat within Australia for species that depend on habitats within and outside Australia.

<sup>7</sup> Taxonomy and conservation of grassland earless dragons: new species and an assessment of the first possible extinction of a reptile on mainland Australia (Melville et. al 2019).

<sup>8</sup> National Recovery Plan for the Grassland Earless Dragon *Tympanocryptis pinguicollis* (Robertson and Evans 2009/2012).

<sup>9</sup> Melville et al 2019 as cited in Biosis 2020.

### Latham's Snipe, *Gallinago hardwickii* (EPBC Act, Migratory; DELWP, near-threatened)

Within the construction corridor, Latham's Snipe may visit seasonal wetlands supporting tussock-grasses and rushes as well as vegetated farm dams. The construction corridor does not include any areas of habitat currently recognised as internationally important, nor areas that are considered likely to support at least 18 individuals of this species.

### White-throated Needletail, *Hirundapus caudacutus* (EPBC, vulnerable/migratory; DELWP, vulnerable)

The White-throated Needletail has previously been recorded from within the construction corridor (near KP 40.45 within the approved MSA area) though was not detected during field assessments for this Project. While it has the potential to use the aerial space over the entire construction corridor, the Project is unlikely to pose a significant risk to the species and the construction corridor is not expected to constitute important habitat.

### Fork-tailed Swift, *Apus pacificus* (EPBC migratory)

The species has not been observed within the Study Area since 2007. While it has the potential to use the aerial space over the entire construction corridor, the Project is unlikely to pose a significant risk to the species and the construction corridor is not expected to constitute important habitat.

## State listed threatened species

The likelihood of State listed threatened species occurring in the construction corridor is described in Table 7-11.

Table 7-11 State listed threatened species

Species	Status	Likelihood of occurrence
Little Egret, <i>Egretta garzetta</i>	FFG, Listed; DELWP, endangered	This species is known to be present in the Study Area most recently from 2008 (VBA). Suitable habitat occurs in the construction corridor, and this species is considered to be an occasional visitor for foraging in wetland habitat located within and immediately adjacent to the construction corridor. The Project is unlikely to pose a significant risk to the species and the construction corridor does not constitute important habitat.
Intermediate Egret, <i>Ardea intermedia</i>	FFG, Listed; DELWP, vulnerable	The species was most recently recorded within the Study Area in 1980 (VBA). The Intermediate Egret is more common in northern Victoria than in southern Victoria, and is likely to be an occasional visitor to wetland habitat located within and immediately adjacent to the construction corridor. The Project is unlikely to pose a significant risk to the species and the construction corridor does not constitute important habitat.
Eastern Great Egret, <i>Ardea modesta</i>	FFG, Listed; DELWP, vulnerable	The species was most recently recorded within the Study Area in 2014 (VBA). The Eastern Great Egret is commonly seen around Melbourne and is expected to use a range of wetlands within and immediately adjacent to the construction corridor. The Project is unlikely to pose a significant risk to the species and the construction corridor does not constitute important habitat.

Species	Status	Likelihood of occurrence
Brown Toadlet, <i>Pseudophryne bibroni</i>	FFG, Listed; DELWP, endangered	The Brown Toadlet was last recorded in the Study Area in 2010 though it is considered possible that the species is now extinct in the Greater Melbourne area as the species has not been recorded for many years, despite targeted surveys at sites where it formerly occurred.
Red-chested Button Quail <i>Turnix pyrrhorthorax</i>	FFG, Listed; DELWP, endangered	The species was last recorded within the Study Area in 2010 (VBA) near Donnybrook. The species may use grasslands habitat throughout the construction corridor, however, it is infrequently recorded in southern Victoria. The Project is unlikely to pose a significant risk to the species.
Lewin's Rail, <i>Rallus pectoralis</i>	FFG, Listed; DELWP, vulnerable	These species potentially occur within the construction corridor in any wetland supporting dense, fringing, emergent long or tussock-grass, reeds and rushes including well-vegetated large farm dams.
Baillon's Crake, <i>Porzana pusilla</i>	FFG, Listed; DELWP, vulnerable	The construction corridor contains suitable habitat for these species, particularly along the main waterway corridors.  While no specific targeted surveys for these species were undertaken, if present they may have been detected while undertaking other species specific targeted surveys across the construction corridor such as during the wetland and waterway habitat assessments and targeted surveys for Growling Grass Frog. Neither of these species were detected during assessments.  The largest areas of suitable habitat for these species in the construction corridor are at the two main waterways that are to be open trench construction (Jacksons and Merri Creeks) and there is potential for minor temporary disturbance to these species if present.
Black Falcon, <i>Falco subniger</i>	FFG, Listed; DELWP, vulnerable	This species is likely to be an occasional visitor to the construction corridor, but no part of the construction corridor is expected to constitute critical habitat.
Common Bent-wing Bat (eastern ssp.), <i>Miniopterus schreibersii oceanensis</i>	FFG, Listed; DELWP, vulnerable	This species forages above the canopy, and is likely to forage occasionally in the airspace of the construction corridor, particularly along the waterways and in larger patches of vegetation. It is unlikely that any maternity caves occur within or immediately adjacent to the construction corridor. Targeted surveys for this species were not undertaken.  The Project is unlikely to pose a significant risk to the species and the construction corridor does not constitute important habitat.
Freckled Duck, <i>Stictonetta naevosa</i>	FFG, Listed; DELWP, endangered	These five duck species use a wide range of habitats and occupy a large distributional range.
Australasian Shoveler, <i>Anas rhynchos</i>	DELWP, vulnerable	There is potential wetland habitat within and immediately adjacent to the construction corridor. The Project is unlikely to pose a significant risk to the species and the habitats within the construction corridor do not constitute important habitat.
Hardhead, <i>Aythya australis</i>	DELWP, vulnerable	
Blue-billed Duck, <i>Oxyura australis</i>	FFG, Listed; DELWP, endangered	
Musk Duck, <i>Biziura lobata</i>	DELWP, vulnerable	

Species	Status	Likelihood of occurrence
Tussock Skink <i>Pseudemoia pagenstecheri</i>	DELWP, vulnerable	<p>Tussock Skinks are associated with tussock grasslands with few or no trees<sup>10</sup>. They are known to occur in the construction corridor and were most recently recorded in 2012 (VBA).</p> <p>This species was detected incidentally during the Striped Legless Lizard tile grid surveys. The species was recorded from 10 of the 20 grids a total of 93 times. Two of the grids were within the MSA approved area and eight were outside the MSA area. Two-thirds of the records (64) came from a single grid (grid 5).</p> <p>This species has the potential to be present in habitat dominated by native or introduced tussock grasses throughout the construction corridor and not just limited to the parcels where they were incidentally observed during tile surveys. They are unlikely to occur in previously cultivated areas.</p>

## Non-native and pest animals

There are records of 24 non-native terrestrial fauna species in the construction corridor, including 14 birds, nine mammals, and one invertebrate (no non-native reptiles or frogs are recorded from the construction corridor). These species vary in their abundance and in their environmental impact. Not all are considered pest species. Species considered to be most detrimental to the natural ecology of the area are identified as having a high level of impact (current).

No CaLP Act-listed pest animals have previously been recorded from the construction corridor, however, European rabbit, European hare and Red fox were found to be established across the construction corridor (Biosis, 2020). Additionally, the non-native House mouse and Common starling were also observed during site assessments.

### 7.3.3 Aquatic ecology

#### Aquatic habitat

The construction corridor is within the Werribee River, Yarra River and Maribyrnong River catchments. Technical Report B *Surface water* determined 23 waterways crossed by the alignment. Named waterways include Merri Creek and Kalkallo Creek (Yarra Catchment) and Jacksons Creek, Deep Creek and the Tame Street Drain (Maribyrnong Catchment).

Additional aquatic habitat in the catchments includes wetlands and farm dams within or adjacent to the alignment. Based on aerial imagery and likely aquatic fauna distribution and habitat preferences, focus was placed on waterways with the highest likelihood of supporting threatened fish with the potential to be present in the construction corridor or influenced by the Project (Merri Creek, Jacksons Creek and Deep Creek).

All other minor drains and waterways intersected by the Project were deemed highly unlikely to support EPBC Act or FFG Act-listed species based on a desktop assessment.

<sup>10</sup> A Complete Guide to Reptiles of Australia (Wilson and Swan, 2003).

## Threatened Species

The desktop assessment determined there were seven nationally or state-listed threatened species or those with habitat potential to occur within the construction corridor, as listed in Table 7-12.

Targeted surveys were conducted at Merri Creek, Jacksons Creek and Deep Creek for Australian Grayling *Prototroctes maraena*. As methods used for targeted surveys also allow for collection of other fish species, the targeted surveys provided data on native and exotic fish species and informed assessment of the general aquatic ecosystem condition.

The desktop assessment and targeted surveys determined that most of the threatened species or habitats are considered to have a low likelihood of occurrence, with Australian Grayling the only species with a medium likelihood (Table 7-12). Further details of the likelihood assessment are included in Technical Report A *Biodiversity and habitats*.

Table 7-12 Likelihood assessment of aquatic values

Common name	Scientific name	Conservation status			Source <sup>^</sup>	Likelihood of occurrence
		EPBC	FFG	DELWP		
Australian Grayling	<i>Prototroctes maraena</i>	VU	L	v	2015 PMST	Medium
Dwarf Galaxias	<i>Galaxiella pusilla</i>	VU	L	e	PMST	Low
Murray Cod	<i>Maccullochella peelii</i>	VU	L	v	2012 PMST	Low
Macquarie Perch	<i>Macquaria australasica</i>	EN	L	e	2015	Low
Australian Mudfish	<i>Neochanna cleaveri</i>		L	c	1991	Low
Silver Perch	<i>Bidyanus bidyanus</i>	CR	L	v	1981	Low
Murray River Turtle	<i>Emydura macquarii</i>			v	2019	Low

<sup>^</sup> Most recent record from VBA

## Platypus

Although not listed under the national EPBC Act, the state FFG Act or the DELWP Advisory List, in 2016 the IUCN Red Listing for Platypus (*Ornithorhynchus anatinus*) was elevated to Near Threatened. On 10 January 2021, the Victorian Government approved a Scientific Advisory Council recommendation to list the Platypus population in Victoria as a threatened species and listed as vulnerable under the FFG Act in Victoria.

The desktop assessment determined that Platypus are present in Jacksons Creek within 200 metres of the construction corridor, but have a low likelihood in Deep Creek and Merri Creek within the vicinity of the Construction corridor. Melbourne Water currently considers the condition of Platypus and macroinvertebrate communities as low in the Merri Creek area, to be primarily due to urban development. For Deep Creek, Melbourne Water currently considers the condition of Platypus as moderate in the Maribyrnong catchment, however, the last record of Platypus in Deep Creek within 5 kilometres of the Construction corridor was in 2007<sup>11</sup>.

<sup>11</sup> Melbourne Water (2018a). Co-Designed Catchment Program for the Yarra Catchment – October 2018. Version 1. Melbourne Water Corporation, Melbourne.



## Main waterways in the construction corridor

### Merri Creek

Within the construction corridor, Merri Creek is mainly an intermittent waterway that flows in winter-spring and after summer rains. However, it is reported to provide drought refuges to aquatic flora and fauna, likely due to groundwater baseflow.

The water quality and condition of the waterway has been well documented and is generally found to be consistently poor. This is reflected in the results of the field assessment, which recorded varying in-stream habitat quality, with habitat in the vicinity of the pipeline crossing being of poor quality. The waterway in this location has previously been disturbed due to the existing VNIE pipeline construction and subsequently rehabilitated.

The desktop assessment indicated 11 native and three exotic fish species are known to occur, or likely to occur in the construction corridor at Merri Creek. No platypus or turtles are known or predicted to occur within the construction corridor at this waterway and no threatened fish species were collected during the targeted surveys. Two common native fish species were detected: Common Galaxias and Short-Finned Eel (Table 7-13). DNA analyses did not detect the presence of the threatened species Australian Grayling in the construction corridor or at those sites upstream and downstream where samples were collected.

Based on habitat observed on site, results of the fish survey and a lack of previous records in the catchment it is considered highly unlikely that the threatened aquatic species listed in Table 7-12 are present in the construction corridor at the Merri Creek.

### Jacksons Creek and Deep Creek

Jacksons Creek and Deep Creek are the major tributaries of the upper Maribyrnong River and are impacted by both urban and agricultural land use pressure. The water quality and overall condition of these two waterways is generally poor, however, riparian corridors provide important habitat networks for fauna movement. The field assessment recorded scattered native shrub and tree species flanking Jacksons Creek and Deep Creek in the vicinity of the proposed waterway crossing, with some clearing of vegetation also evident at Jacksons Creek. The presence of a silt layer in-stream at Jacksons Creek further lowered the quality of habitat present at this waterway.

The desktop assessment indicated 11 native and eight exotic fish species are known to occur, or likely to occur in the construction corridor at Jacksons Creek and Deep Creek. Threatened species Eastern Snake-necked Turtle (*Chelodina longicollis*) and Murray River Turtle (*Emydura macquarii*) were last recorded in 2019 within five kilometres of the construction corridor at Deep Creek and Jacksons Creek. Records for Platypus sightings include a recorded sighting approximately 200 metres downstream of the construction corridor at Jacksons Creek in 2019. Platypus sightings have not been recorded at Deep Creek within five kilometres of the construction corridor since 2007.

Table 7-13 summarises the fish survey carried out at Jacksons Creek and Deep Creek. No threatened fish species were collected during the surveys. Four common native species were detected at Jacksons Creek: Australian Smelt, Flatheaded Gudgeon, Ornate Galaxias and Short-Finned Eel and two exotic species (Eastern Gambusia and Redfin). Three common native species were detected: Flatheaded Gudgeon, Ornate Galaxias and Short-Finned Eel and two exotic species (Eastern Gambusia and Redfin) at Deep Creek. The eDNA analyses did not detect the presence of Australian Grayling in the construction corridor at these waterways or at those sites upstream and downstream where samples were collected.

Based on habitat observed, results of the fish survey and a lack of previous records in the catchment it is considered highly unlikely that the threatened aquatic species listed in Table 7-12 are present in the construction corridor at Jacksons Creek and Deep Creek.

Table 7-13 Summary of fish survey results

Site	Common name	Species name
Deep Creek at pipeline crossing	Short-finned Eel	<i>Anguilla australis</i>
	Flatheaded Gudgeon	<i>Philypnodon grandiceps</i>
	Ornate Galaxias	<i>Galaxias ornatus</i>
Jacksons Creek at pipeline crossing	Shortfinned Eel	<i>Anguilla australis</i>
	Ornate Galaxias	<i>Galaxias ornatus</i>
	Australian smelt	<i>Retropinna victoriae</i>
	Flatheaded Gudgeon	<i>Philypnodon grandiceps</i>
	Eastern Gambusia	<i>Gambusia holbrooki</i>
	Redfin Perch	<i>Perca fluviatilis</i>
Merri Creek at pipeline crossing	Shortfinned Eel	<i>Anguilla australis</i>
	Common Galaxias	<i>Galaxias maculatus</i>

## 7.4 Conservation areas

The BCS identifies 36 areas within the MSA area which are to be protected as conservation areas.

Part of the Project traverses two areas approved under Part 10 of the EPBC Act. These include:

- Conservation Area 34a – Northern Growth Corridor: Growling Grass Frog Corridor (between KP42 and KP44). The construction corridor follows the existing VNIE pipeline easement within the conservation area. This extent of the construction corridor within the conservation area is 2.39 hectares, and 0.59 hectares excluding the existing easement. Native vegetation is present at the creek crossing in this area (as displayed in the mapping in Appendix EE of Technical report A Biodiversity and habitats)
- Conservation Area 28b – Summerhill Road (East), Wollert (between KP48 and KP50). This area was originally classified as an open space area within the BCS to preserve areas of GEVVVP, NTGVVP and Striped Legless Lizard habitat. This is largely within the existing VNIE pipeline easement. This extent of the construction corridor within the conservation area is 1.78 hectares, and 0.53 hectares excluding the existing easement. Native vegetation is not present at the creek crossing in this area (as displayed in the mapping in Appendix EE of Technical report A Biodiversity and habitats).

### What are Areas of Strategic Importance?

Areas of Strategic Importance (ASI) have been identified to protect existing and potential breeding habitat within Growling Grass Frog Conservation Areas from incompatible uses. The Areas of Strategic Importance mapping aims to help partners and those developing land to avoid and minimise impacts on the most critical parts of Growling Grass Frog Conservation Areas.

A Works in Conservation Area (WICA) approval will be required for any works proposed in a Conservation Area. WICA applications are submitted for DELWP's consideration, with some applications also requiring Commonwealth approval prior to commencement of the development.

Conservation Area 34a – Northern Growth Corridor contains Areas of Strategic Importance for the Growling Grass Frog. Of the ASI types intercepted by the Construction corridor, only 0.58 hectares is outside the existing easement. Refer to Section 8.7 and 8.7.1 of Technical report A *Biodiversity and habitats* for further details on the conservation areas and Areas of Strategic Importance.

## 7.5 Risk assessment

The risk assessment identified the risks associated with biodiversity as a result of the Project's construction and operation in accordance with the method described in Chapter 5 *Evaluation and assessment framework*.

The risks associated with biodiversity and habitats were informed by the flora, fauna and aquatic biodiversity values identified in the existing conditions assessment, and the Project activities which could impact those values.

Table 7-14 presents a summary of the 32 construction risks and four operation risks identified and assessed as a part of the biodiversity assessment.

In the case of biodiversity and habitats, some risks are certain to occur since vegetation removal within the construction corridor is not entirely avoidable and risk reduction with additional mitigation may not be possible when the likelihood of the risk occurring cannot be changed. However, in accordance with the mitigation hierarchy, residual impacts on flora and habitats would be offset to comply with relevant Commonwealth and State guidelines.

The environmental management measures are outlined in full in Section 7.9 and Chapter 19 *Environmental Management Framework*.

Table 7-14 Risk assessment for biodiversity

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
Construction						
B1	All	Land clearing during construction impacting EPBC Act and FFG threatened flora	Impacts would be avoided by pipeline realignment and using HDD during construction. EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B8 – Topsoil management	Negligible	None required	Negligible
B2	All	Removal of threatened ecological communities during construction	Pipeline re-alignment at one location would avoid 1 ha of grassy woodland TECs including 10 large trees, and 1.6 ha of grassland TECs. Environmental management measures would minimise impacts on adjoining vegetation and trees, manage soil and surface run-off. Contractor inductions that include awareness of biodiversity issues would be required. EMM B1 – Vegetation management EMM B2 (initial) – Invasive weeds, pathogens, pests and waste (construction) EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B13 – Pest plant/animal/pathogen control – operation) EMM B23 – Tree Management Plan	Very high	The loss (10–20 ha) of FFG/EPBC-listed ecological communities cannot be avoided. In one area where fragmentation leads to a loss of conservation status, this can be partly minimised by environmental management measures. Environmental management measures would provide for reinstatement of native vegetation structure and habitat. TEC losses would be offset as per State and Commonwealth legislation. EMM B15 – Reinstatement native vegetation EMM B18 – Value-specific mitigation	Very high

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B3	All	Land clearing during construction impacting threatened flora (DELWP Advisory List)	EMM B1 – Vegetation management EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B13 – Pest plant/animal/pathogen control – operation	Low	None required	Low
B4	All	Land clearing during construction impacting threatened EVCs	Pipeline re-alignment at one location would avoid grassy woodland including 10 large trees, and 1 ha of Plains Grassy Woodland.  Environmental management measures would avoid impacts on adjoining native vegetation and trees, manage soil and surface run-off, and would require contractor inductions that include awareness of biodiversity issues. EMM B1 – Vegetation management EMM B2 – (pest plant/animal/pathogen control) EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B13 – Pest plant/animal/pathogen control – (operation) EMM B23 – Tree Management Plan	Very high	Losses would be offset. Reinstatement of plant genetic diversity, vegetation structure and habitat. Native vegetation would be offset in accordance with the Guidelines. No species offsets are triggered. EMM B15 – Reinstatement native vegetation EMM B18 – Value-specific mitigation	Very high
B5	All	Land clearing during construction impacting non-threatened flora. All threatened vegetation communities in the construction corridor are comprised of non-threatened flora	Environmental management measures would avoid impacts on adjoining native vegetation and trees, manage soil and surface run-off, and would require contractor inductions that include awareness of biodiversity issues. EMM B1 – Vegetation management EMM B2 – (pest plant/animal/pathogen control) EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B13 – Pest plant/animal/pathogen control – (operation) EMM B23 – Develop and implement a Tree Management Plan	Medium	The localised or temporary reduction of populations are expected to regenerate post-construction during reinstatement. Non-threatened flora losses would be offset. EMM B15 – Reinstatement genetic diversity	Low

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B6	All	Land clearing (non-threatened EVCs)	None recorded in the construction corridor	Negligible	None required	Negligible
B7	All	Erosion/sedimentation, dust, litter or release of contaminants leading to loss or degradation of threatened flora and ecological communities	Any impacts minimised through: EMM B1 – Vegetation management EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B10 – Surface water sedimentation and runoff impacts on ecological values	Negligible	None required	Negligible
B8	All	Erosion/sedimentation, dust, litter or release of contaminants leading to loss or degradation of non-threatened flora	Any impacts minimised through: EMM B1 – Vegetation management EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B10 – Surface water sedimentation and runoff impacts on ecological values	Low	None required	Negligible
B9	All	Spread of weeds/pest animals/pathogens during construction	Weed control would be incorporated into a CEMP, to minimise weed spread through: EMM B2 – pest plant/animal/pathogen control – construction Waste is to be managed in accordance with C7	Low	None required	Low
B10	All	Dewatering (terrestrial GDEs)	Dewatering drawdown is likely to be temporary, minor and localised and will be minimised through: EMM B4 – GDE mitigation	Low	None required	Low
B11	All	Noise, vibration, lighting (threatened fauna)	EMM B5 – lighting impacts to fauna EMM B6 – noise impacts to fauna	Low	EMM B20 – Striped Legless Lizard	Low
B12	All	Noise, vibration, lighting (non-threatened fauna)	EMM B5 – lighting impacts to fauna EMM B6 – noise impacts to fauna	Low	None required	Low

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B13	All	Loss of habitat (threatened fauna)	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B9 – Fauna management EMM B10 – Surface water sedimentation and runoff EMM B23 – Tree Management Plan	Medium	Additional EMMs to reduce the occurrence: EMM B9 – All fauna and EMM B9 – Threatened fauna EMM B8 – Topsoil management EMM B19 – Golden Sun Moth EMM B20 – Striped Legless Lizard EMM B21 – Growling Grass Frog	Medium
B14	All	Loss of habitat (non-threatened fauna)	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B10 – Surface water sedimentation and runoff	Low	None required	Low
B15	All	Erosion/sedimentation (terrestrial fauna)	EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills	Negligible	None required	Negligible
B16	All	Death or injury of Striped Legless Lizard	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B9 – Fauna management	High	EMM B8 – Topsoil management EMM B9 – All fauna EMM B9 – Threatened fauna EMM B20 – Striped Legless Lizard	Low

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B17	All	Death or injury of Growling Grass Frog	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B2 – Pest plant/animal/pathogen control EMM B9 – Fauna management EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion EMM SW7 – Design and construction management (Jacksons Creek) EMM SW9 – Flood Management and Response Plan	Medium	EMM B9 – All fauna EMM B9 – Threatened fauna EMM B21 – Growling Grass Frog	Low
B18	All	Death or injury of fauna	EMM B9 (initial) – Fauna management EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM B14 – Noise, vibration, lighting EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion EMM SW7 – Design and construction management (Jacksons Creek)	Low	EMM B9 – All fauna EMM B9 – Threatened fauna EMM B19 – Golden Sun Moth EMM B20 – Striped Legless Lizard EMM B21 – Growling Grass Frog EMM B22 – Fauna Mitigation – Platypus	Low



Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B19	Pipeline	Erosion/sedimentation (aquatic fauna) – HDD	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B2 – Pest plant/animal/pathogen control pathogens, pests and waste (construction) EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion	Negligible	None required	Negligible
B20	Pipeline	Erosion/sedimentation (aquatic fauna) – open trench construction	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management EMM B2 – Pest plant/animal/pathogen control EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion	Low	EMM SW5 – Implement a monitoring program	Low

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B21	Pipeline	Waterway/wetland habitat (threatened terrestrial and aquatic fauna) – HDD	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B2 – Pest plant/animal/pathogen control EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion	Low	None required	Low
B22	Pipeline	Waterway/wetland habitat (threatened terrestrial and aquatic fauna) – open trench construction	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B2 – Pest plant/animal/pathogen control EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion	Low	None required	Low

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B23	Pipeline	Waterway/wetland habitat (non-threatened terrestrial and aquatic fauna) – HDD	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B2 – Pest plant/animal/pathogen control EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion	Negligible	None required	Negligible
B24	Pipeline	Waterway/wetland habitat (non-threatened terrestrial and aquatic fauna) – open trench construction	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7) – Site rehabilitation EMM B2 – Pest plant/animal/pathogen control EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C1 – Disturbance of existing contamination EMM C6 – Leaks or spills EMM SW4 – River bed or bank erosion	Low	None required	Low
B25	All	Dewatering (aquatic GDEs)	Refer to Construction Dewatering impacts to groundwater GW1 and GW2. EMM B4 – GDE Mitigation EMM GW1 – Minimising dewatering rates and impact on groundwater levels and flows EMM GW2 – Minimise impact on groundwater bore users	Low	None required	Low

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B26	All	Accidental clearing during construction	Accidental damage to vegetation is expected to be limited to localised impacts and will be avoided or minimised through: EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation	Low	EMM B15 – Reinstatement native vegetation EMM B16 – Additional site assessment and management	Negligible
B31	All	Habitat fragmentation	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B8 – Topsoil management	Low	None required	Low
B32	All	Soil compaction (threatened flora, and TECs)	Considered unlikely or at worst temporary and will be avoided or minimised through: EMM B7 – Site rehabilitation EMM B8 – Topsoil management	Low	EMM B15 – Reinstatement native vegetation	Negligible
B33	All	Soil compaction (non-threatened flora and fauna)	Considered unlikely or at worst temporary and will be avoided or minimised through: EMM B7 – Site rehabilitation EMM B8 – Topsoil management	Low	EMM B15 – Reinstatement native vegetation	Negligible
B34	All	Construction activities (Migratory)	EMM B1 – Vegetation management EMM B3 – Contractor awareness EMM B7 – Site rehabilitation EMM B10 – Surface water sedimentation and runoff impacts on ecological values EMM B11 – Surface water contamination EMM C6 – Leaks or spills	Negligible	None required	Negligible
B35	Pipeline	Waterway works (threatened aquatic) – open trench construction	EMM B17 – Barriers to fish passage and/or migration	Low	None required	Low

Risk ID	Work area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
B36	Pipeline	Waterway works (non-threatened aquatic) – open trench construction	EMM B17 – Barriers to fish passage and/or migration	Low	None required	Low
<b>Operation</b>						
B27	All	Accidental clearing during operation	EMM B12 – Vegetation management – operation	Negligible	None required	Negligible
B28	All	Spread of invasive weeds, pathogens, pests and waste during operation	EMM B13 – Pest plant/animal/pathogen control – operation	Low	None required	Low
B29	All	Noise, vibration, lighting during operation (threatened fauna)	EMM B14 – Access dust, noise and lighting	Low	None required	Low
B30	All	Noise, vibration, lighting during operation (non-threatened fauna)	EMM B14 – Access dust, noise and lighting	Low	None required	Low

## 7.6 Construction impact assessment

This section presents a discussion of the construction impacts associated with the Project in relation to biodiversity and are grouped according to eight main themes:

- Land clearing
- Erosion, sedimentation, dust, contamination and soil compaction
- Spread of weeds, pest species or pathogens
- Aquatic ecology
- Death or injury of fauna
- Noise, vibration and lighting impacts to fauna
- Habitat fragmentation.

### 7.6.1 Land clearing reducing the area of native vegetation, populations and habitat

The total construction corridor is approximately 178 hectares, including non-vegetated areas. To determine impacts on native vegetation, populations and habitat, the biodiversity assessment has conservatively assumed that any flora or vegetation communities located within construction corridor would be lost during construction of the Project.

A number of threatened flora were predicted to occur in the construction corridor but were not observed mostly due to a lack of suitable habitats. Based on this, the Project is considered unlikely to cause any significant impacts on threatened or non-threatened flora. Where it occurs, native vegetation consists entirely of EVCs that are endangered in the VVP and CVU Bioregions, some of which are also listed as threatened communities under the FFG Act, and as threatened ecological communities (critically endangered) under the EPBC Act.

The total extent of native vegetation mapped in the construction corridor outside the MSA area is 13.39 hectares. With addition of the area of native vegetation mapped by DELWP as time-stamped data in 2011 inside the MSA area (5.94 hectares), the total area of native vegetation in the construction corridor is approximately 19.33 hectares. However, it is anticipated that the actual amount of native vegetation in the MSA area for the Project is substantially less than currently mapped by DELWP, since VQAs conducted for the Project found that the extent of native vegetation in the MSA was approximately one third of the extent of the time-stamped data mapped in 2011. Therefore, a more realistic estimate of native vegetation removal, based on 2019-2020 field survey data, is 15.32 hectares.

Primarily, loss of native vegetation will be addressed through a hierarchical application of mitigation measures from avoidance to offsetting. In particular, avoidance of native vegetation was one of the criteria in the multi-criteria analysis process for route selection. Refer to Section 7.9 for further detail on environmental management.

The results of desktop assessments and targeted surveys undertaken for the Project concluded with a high degree of confidence that additional threatened flora are unlikely to occur within the construction corridor. The potential for threatened flora to be impacted during construction is considered very low.

This section also details the impact of vegetation loss on habitat for threatened fauna, non-threatened fauna and migratory species.

## Threatened flora

Threatened flora listed under the EPBC Act (19 species), FFG Act (30 species) or flora considered threatened in Victoria (26 species) were predicted to occur within a five kilometre buffer of the construction corridor. Of these, targeted surveys were conducted for 26 species, with three species found. The species occurrence and proposed mitigation are described in Table 7-15.

Table 7-15 Land clearing impacts and mitigation to threatened flora species

Species	Occurrence	Construction impact	Impact and proposed mitigation measures
Matted Flax-lily - listed as endangered under the EPBC Act, threatened under the FFG Act and recognised as endangered in Victoria on DELWP's advisory list (DEPI, 2014)	One Matted Flax-lily plant was recorded within a fence line in an uncultivated area of roadside (KP 23).	No impact proposed as this section of the construction corridor would be bored using HDD and the Matted Flax-lily plant would be avoided during construction.	It will be clearly demarcated and protected by fencing as a designated no-go zone to avoid any accidental impacts.
Tough Scurf-pea - listed as threatened under the FFG Act and recognised as endangered in Victoria on DELWP's Advisory List	A population of Tough Scurf-pea consisting of 48 individuals was recorded and mapped approximately 50 m from the construction corridor boundary, adjacent to a temporary construction area at Wollert Compressor Station (KP 50).	No impact proposed as the pipeline has been realigned at this site to avoid the population of Tough Scurf-pea during construction.	To prevent accidental damage to the population, the Tough Scurf-pea population would be clearly identified and protected by fencing (in addition to the fencing surrounding the construction corridor), and designated a no-go zone.
Arching Flax-lily - recognised as vulnerable in Victoria on DELWP's Advisory List (DEPI, 2014)	The single Arching Flax-lily plant recorded at KP 8 – KP 9 is on private property outside the approved MSA area.	The pipeline construction would require the removal of one plant of Arching Flax-lily and its habitat. This is because HDD or horizontal boring beneath the plant is considered unfeasible owing to the high cost of implementing either of these methods.	Impacts on additional native vegetation in the vicinity would be minimised through the environmental management measures in Section 7.9.

## Threatened vegetation communities

Land clearing during construction would directly impact two EPBC Act-listed threatened ecological communities and two FFG Act-listed threatened communities. The species, impacts and specific mitigation are described in Table 7-16.

Table 7-16 Land clearing of vegetation communities

Community	Mapped area for removal	Additional indirect impacts	Specific mitigation – avoidance
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) – EPBC Act-listed threatened ecological community	3.43 ha outside the MSA area 0.73 ha within the MSA area	In addition to the mapped areas, removal of large trees and fragmentation of patches to the extent that 15 out of 30 patches of NTGVVP will no longer meet the patch size thresholds for the threatened ecological communities and would not meet condition thresholds. The area of vegetation that qualifies as the TEC is reduced.	The pipeline has been re-aligned to avoid 0.92 ha of NTGVVP using HDD at three locations
Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP) – EPBC Act-listed threatened ecological community	2.20 ha outside the MSA area 0.06 ha within the MSA area	In addition to the mapped areas, removal of large trees and fragmentation of patches to the extent that four areas of GEWVVP within a larger patch will no longer meet the patch size thresholds for the TECs and would not meet condition thresholds. The area of vegetation that qualifies as the TEC is reduced.	The pipeline has been re-aligned in the property and would be bored across the road to avoid 2.8 ha of grassy woodland, including 10 large trees, at five locations and 0.98 ha of native grassland at five locations
Western (Basalt) Plains Grasslands Community – FFG Act-listed community	8.98 ha outside the MSA area 1.38 ha within the MSA area	N/A	N/A
Floristic Community 55-04 Western Basalt Plains (River Red Gum) Grassy Woodland – FFG Act-listed community	4.29 ha outside the MSA area 0.32 ha within the MSA area.	N/A	N/A

Vegetation clearing is mostly unavoidable owing to construction practicalities and physical or safety constraints over the length of the pipeline. Environmental management measures to avoid impacts on threatened communities have been incorporated into the design as much as practicable by siting the majority of the construction corridor within non-native vegetation.

Proposed environmental management measures follow the mitigation hierarchy and include minimising direct impacts during construction through no-go zones and implementing a Tree Management Plan (EMM B1), minimising residual impacts through site rehabilitation, weed and pest control, and topsoil management requirements (EMM B7, B2, B13, B8 and B15), and offsetting residual impacts under the EPBC Act and the FFG Act. Refer to Section 7.9 for the environmental management measures.



## Victorian endangered Ecological Vegetation Classes

Land clearing during construction would directly remove six of the endangered Ecological Vegetation Classes (EVCs) discussed in Section 7.3.1.

A total of 13.39 hectares of native vegetation was mapped during field surveys outside the MSA area and is assumed to be directly impacted by the Project. This consists of four endangered EVCs including Plains Grassland (8.98 hectares), Plains Grassy Woodland (4.30 hectares), Riparian Woodland (0.05 hectares), and Aquatic Herbland (0.06 hectares). To avoid further impacts to EVCs, the Project design and/or construction methodology has been refined to avoid 2.7 hectares of Plains Grassy Woodland, 1.26 hectares of Plains Grassland and 1.68 hectares of Riparian Woodland, outside the MSA area.

Within the approved MSA area, 1.93 hectares of native vegetation was mapped during vegetation quality assessments (VQAs). By comparison, 5.94 hectares of native vegetation is mapped as time-stamped data. However, field survey results suggest that the actual area of impacted native vegetation is likely to be lower than the time-stamped data. Conservatively, 5.94 hectares of time-stamped native vegetation is assumed to be directly impacted by the Project. This consists of up to six endangered EVCs including Plains Grassland (1.89 hectares), Plains Grassy Woodland (2.47 hectares), Plains Grassy Wetland (0.17 hectares), Riparian Woodland (0.01 hectares), Stony Knoll Shrubland (1.37 hectares), and Creekline Tussock Grassland (0.03 hectares).

These direct losses of EVCs are considered unavoidable and will be minimised through application of EMM B1 (vegetation management during construction, including no-go zones) and EMM B2 (pest plant/animal/pathogen control). Refer to Section 7.9 for the full list of biodiversity environmental management measures.

There is low potential for impacts on retained native vegetation outside but adjacent to the construction corridor. These impacts could include damage to native trees through encroachment into TPZs and accidental damage by machinery to overhanging branches. Management measures including EMM B1 (vegetation management), EMM B23 (Tree Management Plan), and EMM B3 (contractor awareness) would minimise damage to adjoining vegetation. EMM B15 (Reinstate native vegetation) would promote regeneration in situ and maintain the long-term viability of vegetation.

Residual impacts that cannot be avoided or minimised would be addressed through offsetting in accordance with the relevant DELWP guidelines<sup>12</sup>.

## Reduction in populations of non-threatened flora and area of non-threatened Ecological Vegetation Classes (EVCs)

While only threatened EVCs were found in the construction corridor, these communities are made up of non-threatened flora, including large native trees, which would be directly removed. The relevant flora and EVCs, construction impacts and proposed mitigation are described in Table 7-17.

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<sup>12</sup> *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a).

Table 7-17 Land clearing of non-threatened flora and area of non-threatened EVCs

Type	Construction impact	Mitigation
<p><b>Non-threatened (protected) flora</b> - four of 83 non-threatened native species are protected under the FFG Act. These include:</p> <ul style="list-style-type: none"> <li>• Common Cassinia <i>Cassinia aculeata</i> subsp. <i>aculeata</i></li> <li>• Cudweed <i>Euchiton</i> sp.</li> <li>• Jersey Cudweed <i>Laphangium luteoalbum</i></li> <li>• Cotton Fireweed <i>Senecio quadridentatus</i></li> </ul>	<p>All species are expected to be impacted by construction works.</p>	<p>All four species establish rapidly after soil disturbance and are expected to re-establish post-construction and abundance of non-threatened protected flora within the construction corridor may even increase.</p> <p>A permit to take (kill, injure, disturb, or collect) flora protected under the FFG Act is required from DELWP. All FFG Act permits would be obtained prior to commencement of construction.</p>
<p><b>Native trees</b> - All native trees present within the construction corridor are non-threatened species. These include:</p> <ul style="list-style-type: none"> <li>• River Red Gum <i>Eucalyptus camaldulensis</i></li> <li>• Yellow Gum <i>Eucalyptus leucoxylon</i> subsp. <i>leucoxylon</i></li> <li>• Yellow Box <i>Eucalyptus melliodora</i></li> <li>• Grey Box <i>Eucalyptus microcarpa</i></li> <li>• Swamp Gum <i>Eucalyptus ovata</i></li> <li>• Manna Gum <i>Eucalyptus viminalis</i></li> </ul>	<p>A total of 32 scattered trees (16 large and 16 small) and 12 large canopy trees within patches would be impacted by the Project.</p>	<p>Native trees (both scattered and in patches) would be avoided where possible, particularly large trees and/or trees with hollows which provide important habitat.</p> <p>Prior to construction TPZs would be established so that retained trees are adequately protected from construction or related activities and any lopping of branches that may be required will be carried out by a qualified arborist (EMM B1 – vegetation management; EMM B23 – Develop and implement a Tree Management Plan). Native trees that may be indirectly impacted through encroachment into the TPZ or SRZ would be assessed by an arborist to determine their potential to be retained, or considered to remain viable, as part of a Tree Management Plan (EMM B23).</p> <p>Additionally, contractor inductions that include awareness of biodiversity values (EMM B3 – contractor awareness) would further minimise damage to adjoining vegetation.</p> <p>The loss of remaining large trees that would be directly removed would be addressed through an offsetting arrangement in accordance with the guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017a).</p>

Since the current design mostly intersects areas of non-native vegetation (approximately 77 per cent of the construction corridor) and has avoided a substantial amount of non-threatened flora, impacts on non-threatened flora have been avoided to a large extent. Impacts on non-threatened flora are considered unlikely to result in a substantial change or permanent loss of populations and would be managed through application of EMM B1 (Vegetation management) and EMM B2 (pest plant/animal/pathogen control). Refer to Section 7.9 for the full list of biodiversity environmental management measures.

## Accidental clearing of EVCs

Given that the majority of the Project is located within areas of non-native vegetation, any accidental damage to native vegetation during construction is likely to be limited to localised impacts.

Should construction activities result in accidental clearing, works would cease immediately within or adjoining the construction corridor (EMM B16 – Additional site assessment and management). Botanical surveys would be conducted to assess and map the condition and extent of native vegetation (preferably), or DELWP modelled mapping data may be used to determine offset requirements when site-based information of the native vegetation can no longer be acquired. Within the approved MSA area, time-stamped mapping would apply. The extent and condition of accidental vegetation removal would be reported to the relevant authority as soon as practicable.

Measures to avoid accidental clearing are provided through EMM B1 (Vegetation management) through clearly defining the construction corridor and establishing no-go zones, and TPZs and EMM B3 (Contractor awareness). Implementation of EMM B7 - site rehabilitation would provide measures to reinstate native vegetation and habitat features, and to remediate soils if necessary.

## Loss of habitat supporting fauna

To facilitate construction and operation of the Project, removal of fauna habitat would be required both permanently at the mainline valves (MLVs) and compressor locations, and temporarily for construction access, laydown, spoil storage, parking and trenching. Land clearing during construction could also result in indirect loss or degradation of adjacent habitat that is not cleared but becomes exposed to new detrimental issues. Depending on the severity of the effect, adjacent fauna habitat could be subject to weed invasion, soil compaction, sedimentation and/or erosion, as well as impacts due to dust, noise, vibration, lighting, shading and surface water or groundwater changes.

Loss and degradation of habitat reduces foraging, nesting and dispersal opportunities for fauna in the local area, and confines fauna to the extent of suitable habitat that remains, often increasing within-species and between-species competition, which can threaten the viability of some populations. Most fauna that persist in the construction corridor are adaptable, already coping with a fragmented and degraded habitat landscape. This applies to both common non-threatened fauna and rarer threatened fauna.

For non-threatened terrestrial fauna, most of the species within the construction corridor (such as Red wattlebird, Rainbow lorikeet, Australian magpie, Common froglet) are mobile and/or adaptable, and are persisting within an existing fragmented and degraded habitat landscape. While all habitats within the construction corridor support non-threatened species and land clearing would remove part of this habitat, these species are able to use remaining habitats or even a degraded form of the same habitat.

For threatened terrestrial fauna, some of the habitats are known to or may support threatened fauna. It is noted that impacts within the MSA area are offset through the environment mitigation levies as set out in the MSA Levy Act (refer Section 7.3). Potential impacts on threatened fauna outside the MSA area are discussed in Table 7-18. Environmental management measures would be applied to minimise the impacts on individuals and their habitat.

Table 7-18 Land clearing impacts on habitat for threatened fauna

Species	Construction habitat impact	Mitigation
Golden Sun Moth	19.93 hectares of known and assumed habitat	<p>Confined to the grassy and grassy woodland habitats, disturbance of understorey habitats is expected to be temporary with habitats reinstated following works. However, Golden Sun Moth and Striped Legless Lizard in particular are very susceptible to ground disturbance and may not successfully recolonise these areas. With time, it is possible that the species may return to some or all uses of the construction corridor following the establishment of vegetation, especially foraging. However, it is unknown how effectively Striped Legless Lizards can use areas subject to ground disturbance as part of their foraging territory.</p> <p>Removal of rocks and cracking soils through compaction, which is not then able to be reinstated, may result in permanent impacts.</p> <p>Similarly, it is possible that the Golden Sun Moth may return to some or all uses of the construction corridor after vegetation has been re-established such as flying over the disturbance area and ultimately laying eggs within suitable tussocks. However, there is no documented evidence to support this and the degree to which Golden Sun Moth may recolonise disturbed ground is not well known. Consequently, these areas are considered lost.</p> <p>Such impacts are expected to result in a reduction in the area of occupancy of both the Striped Legless Lizard and Golden Sun Moth.</p>
Striped Legless Lizard	39.34 hectares of known and assumed habitat	
Tussock Skink	6 parcels	
Growling Grass Frog	<p>Deep Creek known habitat (no impact due to HDD construction methodology)</p> <p>Jacksons Creek assumed habitat (0.03 hectares)</p>	<p>The crossing at Deep Creek is to be completed using HDD, therefore impacts on instream and near-bank habitat will be avoided and impacts on any adjacent terrestrial habitat minimised.</p> <p>The crossing at Jacksons Creek is to be completed using open trench construction method (20 m wide corridor) as trenchless construction was not considered feasible for this location. Very little habitat in the form of either emergent or bank aquatic vegetation is present.</p> <p>While Growling Grass Frog are known from this waterway the chance of them using the actual construction corridor is considered low due to the surrounding uses and landscape. Individuals (if present) at these locations are expected to incur a small loss in available habitat (0.03 ha), however, the impact will be temporary and impacted areas will be reinstated following works.</p> <p>Works are proposed to be limited to the low flow period (March to May) when flow variability is also lower to minimise impacts from high flow events such as erosion. Works would be managed through the implementation of environmental management measures that minimise impacts on the waterway and habitat including waterway-specific construction management measures.</p>

Loss of vegetation and subsequent loss of some fauna habitat is unavoidable. However, by adhering to the Project environmental management measures, this clearing would be avoided as far as possible through design, and minimised within each site during construction. Specifically, adoption of EMM B1 (vegetation management), EMM B3 (contractor awareness), EMM B7 (site rehabilitation), EMM B8 (topsoil management), and EMM B10 (surface water sedimentation and runoff) would manage residual impacts. Refer to Section 7.9 for the full list of biodiversity environmental management measures.

Where the removal of native vegetation (fauna habitat) is unavoidable, the Project would meet the assessment and offset requirements of the DELWP guidelines<sup>13</sup>. Environmental management measures to manage residual impacts at Jacksons Creek are proposed in EES Technical Report B *Surface Water*, specifically EMM SW4 (Develop appropriate control measures as part of the Construction Environment Management and Site Rehabilitation Plan for open trench construction) and EMM SW8 (site rehabilitation – Jacksons Creek).

The biodiversity assessment identified that most habitat loss that is likely to, or that may, occur as a result of the Project is small and localised, and for fauna is expected to result in the loss or displacement of individuals rather than populations or species. Habitat degradation (direct or indirect) resulting from nearby land clearing can generally be mitigated, managed and reversed through management actions. Habitat degradation that results from edge effects is more difficult to mitigate and manage, but is considered unlikely to have anything more than a negligible residual impact due to the extensive and largely homogenous nature of the surrounding habitats.

Overall, habitat loss across the construction corridor is expected to have a minor residual impact on threatened and non-threatened terrestrial fauna, with the exception of the Golden Sun Moth and Striped Legless Lizard, where impacts are expected to trigger residual significant impacts under the EPBC Act<sup>14</sup> and are expected to trigger the requirement for offsets under this Act.

## Loss of habitat for EPBC Act migratory species

A total of 20 bird species listed as migratory under the EPBC Act are known or predicted to occur within the Study Area. Some of these may use or visit habitat within the construction corridor occasionally (such as White-throated Needletail, Fork-tailed Swift and Latham's Snipe) but most are seabirds or coastal shorebirds and are unlikely to use habitats within the construction corridor in large numbers or frequently. There is no indication that any location with the construction corridor supports or attracts an ecologically significant proportion of any migratory species, or would be considered important habitat for any migratory species.

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<sup>13</sup> DELWP (2017a). Guidelines for the removal, destruction or lopping of native vegetation. Victorian Department of Environment, Land, Water and Planning, Melbourne. Available at: [https://www.environment.vic.gov.au/\\_\\_data/assets/pdf\\_file/0021/91146/Guidelines-for-the-removal,-destruction-or-logging-of-native-vegetation,-2017.pdf](https://www.environment.vic.gov.au/__data/assets/pdf_file/0021/91146/Guidelines-for-the-removal,-destruction-or-logging-of-native-vegetation,-2017.pdf).

<sup>14</sup> DEWHA (2009b). Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*). Department of the Environment, Water, Heritage and the Arts, 2009. Available at: <http://www.environment.gov.au/resource/significant-impact-guidelines-critically-endangered-golden-sun-moth-synemon-plana>.

Potential direct and indirect impacts on migratory species and their terrestrial and wetland habitats during construction would be managed and minimised through numerous environmental management measures (particularly EMM B1, B3, B10, B11 and C6) which would see native vegetation removal minimised and aquatic habitats protected through management of erosion and sedimentation, run off and potential waterway contamination or degradation. Adherence to EMM B7 (site rehabilitation) would see the construction corridor reinstated with consideration to native vegetation, habitat features and soil compaction.

Based on this, residual impacts to migratory species under the EPBC Act due to habitat removal are not expected to occur.

## Summary of vegetation calculations

Table 7-19 provides a summary of the vegetation calculations relevant in assessing impacts and offsets for the Project.

Table 7-19 Vegetation impact calculations

Community	Bioregion	Inside MSA (Timestamped data)	Inside MSA (Field mapped data)	Outside MSA (Field mapped data)	Total (Field mapped data)
<b>EVCs impacted</b>					
Plains grassland (EVC 132)	VVP	1.89	1.38	8.73	10.11 ha
Plains grassland (EVC 132)	CVU	-	-	0.25	0.25 ha
Plains Grassy Woodland (EVC 55)	VVP	2.47	0.32	4.30	4.62 ha
Aquatic Herbland (EVC 653)	VVP	-	-	0.06	0.06 ha
Riparian Woodland (EVC 641)	VVP	0.01	0.08	0.05	0.13 ha
Stony Knoll Shrubland (EVC- 649)	VVP	1.37	0.14	-	0.14 ha
Creekline Tussock Grassland (EVC 654)	VVP	0.03	-	-	-
Plains Grassy Wetland (EVC 125)	VVP	0.17	-	-	-
<b>Total</b>		<b>5.94</b>	<b>1.93 ha</b>	<b>13.39 ha</b>	<b>15.32 ha</b>
<b>FFG community impacted</b>					
Western (Basalt) Plains Grasslands Community	VVP	1.89	1.38	8.98	10.36 ha
Western Basalt Plains (River Red Gum) Grassy Woodland	VVP	2.47	0.32	4.29	4.62 Ha
<b>Total</b>		<b>4.36</b>	<b>1.71 ha</b>	<b>13.12 ha</b>	<b>14.98 Ha</b>

Community	Bioregion	Inside MSA (Timestamped data)	Inside MSA (Field mapped data)	Outside MSA (Field mapped data)	Total (Field mapped data)
<b>EPBC Community impacted</b>					
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)			0.73 +0.02 (fragmented patches)	3.43 +0.28 (fragmented patches)	4.16 ha +0.30
Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)			0.06 +0.00 (fragmented patches)	2.20 +0.04 (fragmented patches)	2.26 ha +0.04
<b>Total EPBC community (removal)</b>			<b>0.78 ha</b>	<b>5.63 ha</b>	<b>6.41 ha</b>
<b>Total fragmented patches</b>			<b>0.02 ha</b>	<b>0.32 ha</b>	<b>0.34 ha</b>
<b>Total EPBC Community accounted for</b>			<b>0.80 ha</b>	<b>5.95 ha</b>	<b>6.75 ha</b>
<b>Native trees impacted</b>					
Small scattered trees			6	10	16 trees
Large scattered trees			6	10	16 trees
Large canopy trees			3	9	12 trees
<b>NVR report - offsets</b>					
Extent of proposed removal			0.013	14.775	14.789
Large trees to be removed			-	19	19
Offset amount			0.006 General Habitat Units (GHU)	5.521 GHU	5.527 GHU

## 7.6.2 Erosion, sedimentation, dust, contamination and soil compaction

Construction activities such as access tracks and excavation can lead to the mobilisation of sediments and/or contaminants and can have detrimental impacts on vegetation by reducing photosynthetic capacity (for example, sedimentation and dust), mechanical damage to plants (litter) or physiological impacts (contaminants).

Soil compaction impacts can lead to the loss or degradation of threatened flora and ecological communities by hindering moisture absorption, constricting root growth, inhibiting accumulation of soil seed banks and seedling recruitment, and promoting establishment of shallow rooted, weedy annual species.

However, these impacts are likely to be temporary or minor. During construction, measures to avoid impacts from erosion/sedimentation, dust, litter or release of contaminants to retained threatened flora and threatened communities would include hazard management activities that would be managed through EMM B10 (surface water sedimentation and runoff impacts on ecological values) and EMM B8 (topsoil management).

Soil surfaces that have been compacted due to construction activities (and do not support native vegetation), such as those subject to traffic and/or storage areas within the site, would be ripped to allow the topsoil to bind with the subsoil and increase water filtration, prior to revegetation with indigenous native species. Where site rehabilitation is required it would be undertaken in accordance with EMM B7 (site rehabilitation). EMM B1 (vegetation management) provides measures to retain environmental features such as rocks and coarse woody debris to assist with soil stabilisation. Impacts on botanical values from acid sulfate soils or sodic soils are not expected to occur, since these are currently considered a low risk (refer to Chapter 10 *Contamination and greenhouse gas* and Chapter 9 *Ground movement* for further detail).

### Threatened flora and ecological communities

The area occupied by the single Matted Flax-lily would be bored via HDD. The single population of Tough Scurf-pea at Wollert Compressor Station is at a sufficient distance from the construction corridor that significant impacts are not expected and measures would be implemented. The individual Arching Flax-lily would be removed during construction. Based on this, soil compaction during construction impacting threatened flora and ecological communities is considered unlikely or at worse temporary.

Impacts on EPBC Act-listed threatened ecological communities (TECs), FFG Act-listed threatened communities and endangered EVCs, where these are retained, are also expected to be temporary and would be managed in accordance with the environmental management measures. Refer to Section 7.6.1 for a description of these species.

### Non-threatened flora and ecological communities

As discussed, the consequences of any potential impacts are expected to be temporary or minor. No non-threatened EVCs occur in the construction corridor.

Impacts on non-threatened flora from erosion/sedimentation dust, litter or release of contaminants during construction would be managed in accordance with the environmental management measures.

### Terrestrial fauna habitat

Wetlands and waterways in the construction corridor are, or may be, used by a range of threatened and non-threatened terrestrial fauna, including frogs, ducks, egrets, crakes and rails. Construction of the Project may result in unplanned sedimentation and/or erosion that contribute to degradation of wetland habitats for terrestrial species.

Direct and indirect impacts during construction would be managed and minimised through biodiversity management measures including EMM B10 (surface water sedimentation and runoff) and EMM B11 (surface water contamination). Management measures from other disciplines including contamination (refer to Chapter 10 *Contamination and greenhouse gas*) also apply to these impacts, including EMM C1 (disturbance of existing contamination) and EMM C6 (leaks or spills) all aim to reduce the risk of sedimentation, run off and contaminants entering waterways.

Through full implementation of mitigation actions, small and localised incidents of erosion, sedimentation or contamination during construction may still occur due to unexpected events such as particularly heavy rain. However, the residual impacts of those localised incidents causing further ecological degradation of wetland habitats is considered negligible.



## Aquatic habitats

Aquatic habitats receive water from point-sources such as stormwater outlets and non-point sources such as overland flow. This places habitat for aquatic fauna in the direct path of sediments and other contaminants that are mobilised and enter the drainage network. The impacts of erosion, sedimentation, dust, litter and contaminants on aquatic fauna may occur directly or indirectly.

Through application of environmental management measures during the construction phase, the likelihood and extent of potential residual impacts associated with HDD and open trench construction methodologies are reduced. Management measures include limiting impacts by restricting vegetation losses (EMM B1), using suitable erosion and control measures (EMM B10), preventing the delivery of contaminants to waterways (EMM B11) and rehabilitating the construction corridor to prevent future erosion and sedimentation impacts (EMM B7).

Potential aquatic ecology impacts associated with erosion at Jacksons Creek and blow-out where HDD construction techniques are applied are managed by environmental management measures identified in Chapter 9 *Ground movement*, Chapter 10 *Contamination and greenhouse gas* and Chapter 8 *Water*.

### 7.6.3 Spread of weeds, pest species or pathogens

The introduction or spread of weeds, pest species or pathogens can lead to a reduction in ecological values. This is discussed in more detail in the sections below.

#### Weeds

The construction corridor generally has very high levels of weed infestation, including widespread populations of CaLP Act-listed noxious weeds. A total of 11 CaLP Act-listed noxious weeds were recorded in the construction corridor (refer to Table 7-5 for further detail on the species).

Project construction activities, such as moving plant and equipment through infested areas, may spread weeds listed under the CaLP Act. This could result in the decline in quality of native vegetation within the construction corridor and adjacent areas. Many weeds in the construction corridor are aggressive colonisers well suited to fertile basalt soils and can outcompete and displace native vegetation.

To avoid exacerbating the already high weed levels in the construction corridor, works would be consistent with the weed control measures in the Construction Environment Management Plan (CEMP) for the Project. This would include reasonable steps to prevent the growth and spread of CaLP Act-listed noxious weeds and Weeds of National Significance (WoNS) and prevent the spread of established weed species during construction by implementing vehicle and equipment hygiene.

Potential residual impacts associated with relocating topsoil during the clear and grade phase and reinstatement phase would be mitigated by EMM B2 (pest plant/animal/pathogen control - construction), to manage biosecurity risks and meet CaLP Act obligations.

### Pathogens impacting vegetation

Disease caused by Cinnamon Fungus is a key threatening process under the EPBC Act due to its actual and potential impacts on threatened species and ecological communities, and is considered a major threat to Australia's biodiversity. While the pathogen can spread locally through soil or water via tiny swimming spores, it is more commonly spread through the movement of contaminated soil and gravel carried by vehicle or foot traffic. Without proper soil testing, this microscopic pathogen is difficult to detect.

#### What is Cinnamon Fungus?

A soil-borne pathogen that attacks and destroys plant root systems causing plants to die through lack of water and nutrients. The disease is also known as die back, root rot, PC or Phytophthora and has the ability to alter the ecology of entire ecosystems. This can lead to major declines in some insect, bird and animal species due to the loss of shelter, nesting sites and food sources. Once an area is infested with the pathogen, eradication is usually impossible.

The risk of Cinnamon Fungus occurring in the construction corridor is minor, since it is commonly found in soils that have neutral to acidic pH, which are most favourable for the formation of spores and the survival of the fungus<sup>15</sup>, rather than in grassy vegetation on fertile soils, such as in the construction corridor.

Potential introduction and spread of Cinnamon Fungus is considered highly unlikely owing to vegetation and soil types within the construction corridor and would be managed through EMM B2 (weeds/pathogens and waste during construction) and EMM B8 (topsoil management), as well as management of waste in accordance with EMM C1 (implement spoil management measures).

### Pest fauna species

Some non-native terrestrial and aquatic fauna species in the study area are considered pest species and are likely to have a detrimental impact on the natural ecology of the construction corridor. Given the construction corridor is already highly disturbed and partly urbanised, the Project is considered unlikely to exacerbate the impact of any pest animal or fish species.

Management measures to reduce the risk of exacerbating the impact of terrestrial pest animals would include the implementation of EMM B2 - management measures for waste (including litter, which may attract pest animals) during construction and operation in accordance with the Environment Protection Act, and to reduce the spread of weeds which can also encourage pest animals.

### Pathogens impacting fauna

One known pathogen that affects fauna is amphibian chytrid fungus which causes the disease chytridiomycosis, which can result in high mortality of frogs. "Chytridiomycosis due to the amphibian chytrid fungus" was included on the List of Key Threatening Processes under the EPBC Act on 23 July 2002, and is included in the list of potentially threatening processes under the FFG Act. It is highly infectious and can be spread via zoospores on frogs and tadpoles, and potentially in water, on wet equipment and within moist soils (such as on boots, tyres vehicles, equipment).

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<sup>15</sup> Zentmyer GA (1980) *Phytophthora cinnamomi* and the diseases it causes. Monograph 10, American Phytopathological Society, St Paul, Minnesota, USA, p: 96.

Given the highly infectious nature of the fungus, the long history of disturbance to waterways and landforms in the Melbourne area, and the ubiquity of Common froglet (*Crinia signifera*) in Melbourne's waterbodies, the pathogen is likely to be widespread throughout frog habitats within the construction corridor already.

Therefore, the likelihood of introducing the fungus to the construction corridor (such as through transport of soil, wet or muddy equipment) is low, as is the likelihood of a catastrophic epidemic occurring within the construction corridor as a result of this Project. It is noted that different strains of the fungus may vary in how lethal they are to frogs, so avoiding continued spread of the fungus is critical to management of this pathogen. If a new strain of the chytrid fungus is introduced, then a larger impact is possible. If infected materials (such as soil, equipment, vehicles) are brought in from elsewhere, there is a chance of a novel and more pathogenic strain establishing.

Measures would be taken to minimise the risk of spreading the amphibian chytrid fungus into, out of or within the construction corridor. Management measures include EMM B2 (soil management and cleaning of vehicles) and EMM B21 (hygiene protocols for the handling of any frogs). Following implementation of these measures, the residual impacts to fauna are expected to be low.

Epizootic Haematopoietic Necrosis Virus (EHNV) is an Australian virus that has the potential to negatively impact several native fish species. The movement of construction equipment from one waterway to another can spread the virus, and therefore the residual impact would be managed by EMM B2 (soil management and cleaning of vehicles).

## 7.6.4 Aquatic ecology

### Trenchless and open trench construction creek crossing construction activities impacting aquatic habitat

Construction of the Project creek crossings using trenchless (HDD) construction and open trench construction creek crossing methodologies could impact riparian vegetation and in-stream habitats associated with waterways and wetlands. Therefore, construction activities may increase the risk to terrestrial and aquatic fauna that use rivers and other waterbodies either indirectly reducing habitat through the loss of riparian vegetation, or directly through the physical disturbance of aquatic habitat.

While higher impacts may be expected for open trench construction compared to HDD, the biodiversity assessment applied the same low risk rating to threatened species for both construction techniques. This is predominantly because there is limited riparian vegetation and in-stream habitat in the areas proposed for open trench construction. The likelihood of HDD impacting riparian and in-stream habitats is unlikely but could occur in certain conditions.

Potential residual impacts would be reduced through application of appropriate environmental management measures during the construction phase. The relevant environmental management measures during the construction phase are targeted at limiting impacts by restricting vegetation losses (EMM B1), using suitable erosion and control measures (EMM B10), preventing the delivery of contaminants to waterways (EMM B11) and rehabilitating the construction corridor to prevent future erosion and sedimentation impacts (EMM B7).

### What is a riparian zone?

The riparian zone is the area of land bordering rivers and other waterbodies that directly influences ecosystem health. Riparian zones provide critical habitat for flora and fauna and provide connectivity between remnant vegetation in the landscape. Vegetation in the riparian zone supplies organic matter to waterways that provides food and habitat for fish and other fauna, while shading can regulate water temperature and reduce the occurrence of algal blooms. This vegetation can also filter sediment and nutrients from runoff and aid to stabilise banks and reduce erosion.

## Loss of connectivity

Open trench construction technique at Jacksons Creek and Merri Creek has the potential to create barriers to movement and migration of aquatic fauna, however, HDD construction at Deep Creek is not considered to pose a risk to fish connectivity.

Threatened aquatic species, in particular the migratory Australian Grayling (*Protonectes mareana*) are not reported to occur in either Jacksons Creek or Merri Creek and were not detected during the targeted surveys. Missing a spawning season due to factors such as barriers to migration may have major implications for Australian Grayling as the species may spawn only once or twice in its lifetime and many only live for a couple of years<sup>16 17</sup>. However, the likelihood of impacts due to the creation of barriers is considered remote as the species is not expected to be present.

The native fish species that are known to occur and were found during targeted surveys are common, widespread, abundant and many are not obligate migratory species. Those that are obligate migratory species are Common Galaxias (*Galaxias maculatus*), Australian Smelt (*Retropinna semoni*) and Southern Shortfin Eel (*Anguilla australis*). However, impacts to native fish is considered unlikely as any barriers to connectivity would be short-term and within the range of barriers already present, and insignificant changes to populations are expected.

During construction cofferdams or similar methods would be used, likely across the entire waterways. However, it is anticipated the works would occur for around two to four weeks and barriers to migration already exist in Jacksons Creek immediately downstream of the construction corridor and in Merri Creek near Craigieburn<sup>18</sup>. Given this, the risks of a temporary lack of connectivity would be minor and not cause any impacts to population viability.

To manage residual impacts due to the creation of a barrier that impedes passage or migration for native fish, the time required to complete construction while cofferdams are in place will be limited as outlined in EMM B17. With site rehabilitation (EMM B7), there are not expected to be any ongoing impacts.

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<sup>16</sup> Bishop, K A, & Bell, J D (1978). Aspects of the biology of the Australian grayling *Prototroctes mareana* Gunther (Pisces: Prototroctidae), Australian Journal of Marine and Freshwater Research, 29, pp. 743–761.

<sup>17</sup> Backhouse, G, Jackson, J, & O'Connor, J (2008). National Recovery Plan for the Australian Grayling *Prototroctes maraena*, Melbourne.

<sup>18</sup> Melbourne Water (2018a). Co-Designed Catchment Program for the Yarra Catchment – October 2018. Version 1. Melbourne Water Corporation, Melbourne.

## 7.6.5 Groundwater drawdown

Groundwater drawdown during construction could lead to impacts on both terrestrial and aquatic flora and fauna, including groundwater dependent ecosystems (GDEs). During construction there are likely to be some excavations deeper than the water table that will require dewatering over short periods. The pipe trench may be below the water table which may potentially impact on groundwater flow paths. These potential impacts on groundwater levels may subsequently impact GDEs and their associated plants and animals, depending on their degree of groundwater dependency.

Chapter 8 *Water* and Technical report C *Groundwater* considers that the impact of construction drawdown on GDEs is likely to be minor. This is due to the minor drawdown extent, short duration (approximately two to four weeks), and design of construction activities to minimise the requirement for dewatering where possible.

Regarding terrestrial ecosystems, numerous patches of vegetation considered to be groundwater dependent are within the construction corridor (2005 modelled vegetation mapping by the former Victorian Department of Sustainability and Environment). Given that groundwater impacts to grassy woodland, grassland or shrubland are remote, only Riparian Woodland that is distributed along major waterways is assessed. The deep-rooted and perennial River Red Gum dominates riparian woodlands within the construction corridor and has the ability to actively manage its groundwater dependency. However, if a groundwater depth threshold is reached where tree roots are no longer able to access available soil moisture, tree condition is likely to deteriorate and trees may suffer.

Regarding aquatic ecosystems, there are several wetlands throughout the construction corridor identified as GDEs. The majority of fauna associated with GDEs are highly mobile (for example, waterbirds) and are not expected to be impacted by any potential impacts to GDEs. The less mobile frogs may be impacted if there is a loss of these wetland habitats. However, targeted survey within the construction corridor has demonstrated that frogs are not prevalent throughout the construction corridor with the targeted surveys for Growling Grass Frog not finding frogs of any species in a majority of locations surveyed. The Growling Grass Frog was found to be present in only one wetland (inside the MSA) but is not considered a GDE.

The major waterways in the construction corridor (Jacksons, Deep and Merri creeks) undergo natural periods of high and low flow in response to climatic conditions, with the upper reaches of Merri Creek having the potential to act as refuge pools during times of drought. Based on the ecological field surveys and findings of Technical Report C *Groundwater*, drought refuge pools are unlikely to be present within the estimated distance of groundwater drawdown influence from the Project crossing at Merri Creek.

Based on Technical report C *Groundwater* and the nature of River Red Gums being sufficiently deep-rooted to withstand temporary and short-lived fluctuations in the water table, impacts on biodiversity values associated with GDEs due to groundwater drawdown is highly unlikely. Residual impacts on GDEs, including groundwater flow paths and deep rooted trees, would be addressed through EMM B4.

### 7.6.6 Death or injury of fauna

Construction activities could lead to death or injury of fauna, mainly through land clearing (habitat removal) or fauna straying into a construction area. Those most at risk are fauna that reside in the habitats to be removed and have limited mobility (such as frogs, small reptiles, possums), dependent young (such as young birds in a nest or Platypus juveniles in burrows), or fauna that stray into a construction area during a quiet time (for example, overnight). Fauna straying into a noisy active construction site during the day is considered unlikely and would be actively managed through general site and trench management (EMM B9).

#### Common species

For most of the construction corridor, fauna most likely to be encountered in a construction site are common species. The presence of uncommon or threatened species is expected to be limited to sections of the construction corridor where known or assumed habitat has been identified.

Death or injury of some fauna may occur, but it is expected to be infrequent and localised, and most likely to affect individuals rather than populations or species. Death or injury of common species is not expected to have a long-lasting effect on any of the populations of common fauna in the construction corridor.

Residual impacts on common species would be managed through implementation of EMM B9 which would require management of fauna displaced or harmed due to habitat removal in compliance with the Wildlife Act, undertaking pre-clearing surveys and inspections to confirm the on-site location of fauna immediately prior to habitat removal, and assisting fauna to safety as necessary. This would also enable the reporting of incidental threatened fauna finds, with any clearing works in the vicinity to be stopped until an evaluation and approved response could be established.

#### Platypus

Construction activities at Jacksons Creek could potentially impact Platypus as they are known to exist within the Study Area at this location, however, have a low likelihood of occurring in Merri Creek and Deep Creek.

While there would be some loss of potential Platypus habitat in Jacksons Creek during open trench construction, this loss would be relatively minor compared to available habitat elsewhere in the waterway. By adhering to mitigation measures that limit the direct loss of habitat such as vegetation (EMM B1), and indirect loss due to litter, erosion, sedimentation and contamination (EMM B10 and B11), the residual impact on Platypus would be limited. Site rehabilitation after construction should also be employed to recover any lost habitat (EMM B17). Appropriate mitigation measures would also limit the influence of changes to flow (EMM SW7) and water quality (EMM SW5 and EMM SW6). Given the window for undertaking works in EMM B22 is between March and August, and surface water measures (for example, EMM SW7) recommends works during the low flow period, the window for open trench construction is between March and May.

To manage potential impacts to Platypus movement between reaches upstream and downstream of the construction corridor, egress points in the cofferdams and trenches would be installed to allow any trapped individuals to escape, and exclusion grills would be applied to pumps and pipes (EMM B22). The construction of the trench across Jacksons Creek has the potential to directly impact on Platypus in burrows. This is particularly so during the breeding season when females are caring for juveniles, should there be burrows in this specific location. The risk is low if construction works are delayed until after the time when nesting burrows are used.

Surveys would be undertaken prior to excavation works for nesting or camping burrows that may be impacted. If the presence of nesting burrows can't be ruled out, APA would review the timing for construction works in Jacksons Creek to consider scheduling from March when nesting burrows are no longer used (EMM B22). Construction timing would give consideration to all relevant inputs in minimising impacts in the Jacksons Creek location including surface water, cultural heritage and biodiversity. If burrows are observed or can't be ruled out, excavations would proceed carefully to allow any individuals present to escape (EMM B22).

## Threatened terrestrial fauna

Due to their listed status, impacts on the Golden Sun Moth, Striped Legless Lizard and Growling Grass Frog could be more significant as impacts on fewer individuals can have a greater impact than that of common widespread fauna species. Refer to Table 7-20 for further detail on potential impacts and proposed mitigation measures for each threatened species.

Table 7-20 Threatened terrestrial fauna impacts

Species	Construction impact	Mitigation measures
Golden Sun Moth	The larval stage of the Golden Sun Moth is the most susceptible to death or injury during construction activities. Therefore, topsoil management is expected to be particularly important to survival of larva.	EMM B19 requires the preparation of a Golden Sun Moth management plan that includes appropriate mitigation detailing, as a minimum, locations of habitat subject to mitigation, topsoil management, rehabilitation measures, on-going management and/or monitoring. Dust would be managed during the flying season (November to January) in properties known or assumed habitat to minimise impacts on flying adult Golden Sun Moth (EMM B14).
Striped Legless Lizard	Land clearing of areas of known Striped Legless Lizard habitat could lead to death or injury of fauna without mitigation measures.	In areas of known Striped Legless Lizard habitat, EMM B20 minimise risk of death or injury by initially making the habitat unsuitable, tyning the area, relocating any individuals found during tyning and installing fauna-proof fences to prevent recolonisation during construction. Details of these activities would be outlined within a Striped Legless Lizard Management Plan. EMMs B1 (land clearance and vegetation loss), B4 (contractor awareness), B7 (site rehabilitation) and B8 (topsoil management) are also applicable to reducing the risk of death or injury to the Striped Legless Lizard by minimising the extent of habitat removal, implementing inductions to protect environmental values, reinstatement of habitat with consideration to native vegetation, habitat features and soil compaction and protection of topsoil in areas of temporary works.

Species	Construction impact	Mitigation measures
Growling Grass Frog	<p>Deep Creek is expected to be crossed via HDD and impacts at this location are expected to be minimal. At Jacksons Creek, construction would be restricted to outside the frog's peak active period (November to March) but is required to be conducted between March to May to minimise the risk of sedimentation from potential high flow events at other times of the year.</p> <p>Works in waterways would be limited to March to May outside of the Growling Grass Frog season and during the low flow period that has the least amount of variability. This would avoid impacts on Growling Grass Frog individuals and minimise potential damage to habitat as a result of erosion caused by high flow events.</p> <p>Based on this, the chance of Growling Grass Frog individuals within the actual construction corridor at these locations is considered low.</p> <p>Indirect impacts that could result in death or injury to Growling Grass Frog include sedimentation, run off, surface water contamination, leaks or spills and river bed or bank erosion.</p>	<p>Several measures in EMM B21 are specific to minimising death or injury to Growling Grass Frog in areas of known or assumed habitat for this species. Impacts on individuals would be further mitigated through pre-clearance and salvage and relocation activities (relocation is required within adjacent habitat preferably within 100 m).</p> <p>A salvage and relocation plan would be prepared for the Project for this species to detail habitat removal, salvage protocols and locations of relocation. EMMs B1 (land clearance and vegetation loss), B4 (contractor awareness) and B7 (site rehabilitation) are also applicable to reducing the risk of death or injury to the Growling Grass Frog. EMM B2 is required to minimise the risk of the spread of chytrid fungus.</p> <p>To manage potential indirect impacts, EMM B10 (surface water sedimentation and runoff), EMM B11 (surface water contamination), EMM C1 (disturbance of existing contamination), EMM C6 (leaks or spills) and EMM SW4 (river bed or bank erosion) would be applied.</p>

By adhering to these fauna management measures, as well as requirements for relocation of threatened fauna (EMM B9), residual impacts on all of the threatened species are reduced to low.

### 7.6.7 Noise, vibration and lighting impacts on fauna

As the Project is located within a partly rural landscape and is restricted to a 30 metre corridor, noise, lighting and vibration impacts on fauna are expected to be highly localised and minimal. Due to the broader distribution of non-threatened fauna, potential impacts on non-threatened terrestrial fauna are expected to be minimal but more widespread than those on threatened fauna. The potential severity of disturbance varies with species and location.

Temporary night works would require adequate lighting which may disturb or displace native or non-native fauna. Artificial light can reduce the success of some nocturnal predators, by giving the potential prey an advantage or favour more tolerant nocturnal predators, and/or disrupt the typical nocturnal behaviour of fauna. This can result in some fauna no longer occurring in habitats nearest to the lit areas. To minimise the escape of light during the Project's construction, management measures including EMM B5 (lighting impacts on fauna) will be required to protect significant native fauna habitat to the extent practicable.

Residual lighting impacts to fauna are unavoidable but are expected to be minor and localised. Disturbance of fauna is most likely to affect individuals rather than populations or species and is not expected to have a long-lasting effect on the populations of fauna in any location.



During daylight hours, Project construction noise has the potential to impact on terrestrial fauna by displacing active diurnal birds, and/or roosting nocturnal fauna, which could make them more susceptible to predators or competitors. During night works, Project construction noise has the potential to impact on terrestrial fauna through temporary displacement of nocturnal birds and mammals, and roosting diurnal fauna. As this would be at night, it could make them more susceptible to predators. Night works could also lead to temporary silencing of frogs, which could impact the breeding cohort in that location, if the construction period lasts longer than the frogs' breeding/calling season.

Reptiles may also experience temporary displacement, for example, snakes and lizards may move away from noise or vibration in the area where high-impact disturbance occurs. Such displacement may push individuals into sub-optimal habitats increasing their susceptibility to predation and competition. As fish use sound for communication, hunting and predator avoidance, human-induced noise may impact fish by generating high intensity noise (may kill or damage hearing of fish) or low intensity noise (may lead to behaviour changes in the long-term)<sup>19</sup>.

Most of the fauna habitats nearest the corridor are not known to support threatened species that would be impacted by noise. The most susceptible threatened species considered are:

- **Growling Grass Frog:** blasting is proposed at 13 fish locations (including five outside of the MSA area), however, there is no Growling Grass Frog habitat in the vicinity of the construction corridor at any of these five locations. Within the MSA the key areas of potential impact for blasting are within the two Conservation Areas (particularly Conservation Area 34a – Northern Growth Corridor, between KP42 and KP43). As construction is expected during daylight hours and to avoid the peak breeding period (November and December) at these locations, noise is not expected to disrupt the species' ability to hear or be heard when calling. Construction at Deep Creek may occur outside of normal working hours and may occur after dark when Growling Grass Frog predominately call. However, as calling is typically restricted to November and December and construction is scheduled after January at this location this is not expected to result in disruption to Growling Grass Frogs' ability to hear or be heard
- **Striped Legless Lizard:** Blasting is not proposed in any known habitat outside the MSA area, though is proposed within some areas of assumed habitat including both areas that have and have not been subject to tile grid survey. While presence of the species has been assumed in these areas, the likelihood of occurrence of the species is lower. Within the MSA area blasting is proposed within Conservation Area 28b – Summerhill Road (East), Wollert (between KP48 and 49).

Construction noise is not expected to result in persistent noise and would be temporary and short term. The implementation of management measures including EMM B6 (noise impacts on fauna) would require that noise and vibration be managed in accordance with the requirements outlined within EMM NV1 and NV2. These measures outline the required guidelines for noise and vibration and set out work hours. Residual impacts on terrestrial fauna are expected to be unavoidable, but minor, localised and short term, as fauna would most likely return to the habitat when the noise disturbance subsides and impacts are most likely to affect individuals rather than populations or species.

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<sup>19</sup> Popper A.N. and Hastings M.C. (2009). The effects of human-generated sound on fish. *Integrative Zoology* 4, pp: 43–52.

Access across Merri Creek is proposed from January to facilitate construction at the watercourse during low flow period and also provide access to construct the pipeline between the railway crossing and Merri Creek at KP 41–43. If this timing is not achieved, then an additional 3.4 kilometres of new access track will be required to provide access (to the north of KP 42 to Beveridge Road). With the appropriate mitigation measure as outlined in EMM 21, the risk of impacts to individual Growling Grass Frog at this location are considered low as a result of seasonal timing and diurnal noise, and are preferable to additional clearance of this quantity.

### 7.6.8 Habitat fragmentation

Vegetation removal and/or temporary modification of waterways may result in temporary localised fragmentation of some fauna habitats. Fragmentation of habitat and isolation of habitat patches reduces the ability of some fauna to disperse across the landscape, and may threaten the viability of some populations.

Habitat fragmentation can affect both non-threatened fauna and rarer threatened fauna. Common, mobile and adaptable species (such as the Red Wattlebird and Rainbow Lorikeet) tend to be least affected by fragmentation, as habitat gaps tend not to create barriers to their movement. These species tend to be the ones that persist in the disturbed areas currently. Some mobile threatened species also are able to cope with already fragmented landscapes (such as the Grey-headed Flying-fox), as determined by their continued use of trees in metropolitan, rural and disturbed areas. Areas where connectivity for fauna movement will be restricted during construction may also impact local kangaroo populations. In areas where this is expected the risks to kangaroo individuals will be managed through specific Kangaroo management outlined within a Fauna Management Plan (EMM B9).

Given the relatively narrow construction corridor, the loss of habitat connectivity associated with the Project is expected to be temporary, localised, and minimal for most species. Construction activities including open trench construction is likely to create a barrier to movement for both threatened and non-threatened ground-dwelling and relatively immobile fauna. However, following installation of the infrastructure, trenches would be backfilled and habitats would be rehabilitated. These areas are expected to be recolonised by most species, and no long-lasting fragmentation is expected.

Grassland threatened species such as Golden Sun Moth are capable of flying across such distances during works and following reinstatement so the construction corridor is not expected to create a long-term barrier. However, the ability for the Striped Legless Lizard to cross disturbed ground is not well understood. Following establishment of vegetation, it is possible that the species may use the areas as part of its broader foraging territory, but it is unknown to what degree if at all this may occur. It is therefore possible that the construction corridor may become a short- to medium-term barrier to movement by the Striped Legless Lizard, resulting in fragmentation of its habitat until such time as the grass cover and structure (providing shelter and potentially supporting a food source) returns.

Construction activities in waterways including Jacksons Creek and Merri Creek would include use of cofferdams or similar methods, likely across the entire waterways. However, given the relatively short duration of works (two to four weeks), combined with the fact that barriers already exist downstream from the construction corridor in both waterways, mean that impacts would be temporary and not cause long-term fragmentation of habitat. Works within Jacksons Creek would also be outside the Growling Grass Frog peak active period (November to March) to minimise impacts on individuals and connectivity. Following works, waterways would be reinstated and there would be no permanent barrier to frog movement.

Rehabilitation activities are expected to be completed within three months of construction with the aim of restoration of ground cover within six months (EMM B7). It is likely that until ground cover is established these areas would not be used by fauna.

Residual impacts associated with habitat fragmentation would be minimised through Project design, and measures to avoid accidental loss of habitat (EMM B1) and contractor awareness (EMM B3). Reinstatement of vegetation (EMM B7) and topsoil management (EMM B8) within the construction corridor would allow continued passage of fauna and help to reduce the long-term effect of additional habitat fragmentation (EMM B7).

## 7.6.9 Construction residual impacts summary

With the implementation of mitigation measures, residual impacts on biodiversity during construction include:

- Land clearing during construction would impact one individual of threatened plant species, Arching Flax-lily *Dianella longifolia* var. *grandis*, 15.32 hectares of native vegetation as well as 6.41 hectares of two EPBC Act TECs, and two FFG Act threatened communities. The majority of the extent of both of these communities occurs outside the MSA
- Land clearing during construction would impact endangered EVCs and threatened communities. These losses are considered unavoidable since design options have included reducing the construction corridor, using HDD where practicable, and maximising use of non-native vegetation as temporary construction areas. The Project is likely to have a significant impact (based on EPBC Act significance criteria) on EPBC Act TEC Grassy Eucalypt Woodland of the Victorian Volcanic Plain based on five criteria. It is also likely to have a significant impact on TEC Natural Temperate Grassland of the Victorian Volcanic Plain based on two criteria. The single Arching Flax-lily is likely to be unviable in the longer term and the overall impact on the species is considered minor. These impacts have been minimised as far as practicable. However, since vegetation removal would occur, any further reduction to the residual impacts has not been achievable. Areas disturbed during construction where these communities occur would be reinstated
- Land clearing may also result in temporary localised fragmentation of some fauna habitats. Habitats within the construction corridor that support threatened terrestrial fauna are mainly confined to the higher quality grassland areas and waterways. Impacts on threatened fauna are expected to be largely limited to four species: Golden Sun Moth, Striped Legless Lizard, Growling Grass Frog and Tussock Skink
- Disturbance of understorey habitat due to land clearing on the Tussock Skink is expected to be temporary with habitats reinstated following works. This would allow the species to recolonise the area following reinstatement from adjacent contiguous areas of habitat that can be used during construction
- Golden Sun Moth and Striped Legless Lizard in particular are very susceptible to ground disturbance and may not successfully recolonise these areas. With a majority of the construction corridor comprising grassland habitats, these two species are expected to experience the greatest impacts of land clearance, with respective totals of 19.93 hectares and 39.34 hectares of known or potential habitat expected to be impacted. Impacts have been minimised as far as practicable. However, since habitat removal will occur, any further reduction to the residual impacts has not been achievable. The Project is likely to have a significant impact (based on EPBC Act significance criteria) on EPBC Act-listed Striped Legless Lizard and Golden Sun Moth. Unavoidable loss of habitat for these two species will be managed through Commonwealth offsetting as required under the EPBC Act

- Disturbance of Growling Grass Frog habitat during construction has been assessed at two locations outside the MSA, where the species are known or assumed to be present. While individuals (if present) at these locations are expected to incur a small loss in available habitat the areas of impact would be temporary and would be reinstated following works. These locations are:
  - Deep Creek: impacts would be avoided due to HDD construction (no residual impact)
  - Jacksons Creek: impacts may occur due to open trench construction, but are managed through a reduction in the construction corridor in this location (20 metres) and relevant environmental management measures
- Impacts due to sediment, dust, litter or the release of other contaminants to waterways and wetlands is managed by the use of HDD, where possible, and the application of environmental management measures
- Potential death or injury of fauna are more likely to impact individuals rather than populations
- Impacts as a result of noise, vibration and lighting are expected to be minimal as they are expected to be highly localised on the narrow construction corridor.

## 7.7 Operation impact assessment

This section presents a discussion of the operational impacts associated with the Project in relation to biodiversity and are grouped according to three main themes:

- Accidental clearing
- Spread of invasive weeds, pathogens, pests and waste
- Disturbance of fauna through noise, vibration or lighting.

### 7.7.1 Accidental clearing

No vegetation removal is proposed during Project operation and is unlikely as most of the Project is located in non-native vegetation. Should any accidental removal occur, it is expected that this would be limited to minor works associated with maintenance, with little impact beyond individual plants, tree branches or extremely small patches of vegetation.

Should operational activities result in accidental impacts to EVCs within or adjoining the operational easement area, accidental clearing would be addressed by EMM B12 (vegetation management – operation), which includes:

- Access and works areas being limited to the easement and designated access routes
- Any vegetation to be protected is to be flagged on site ahead of conducting clearing activities
- No clearing within 10 metres of waterway banks without a Works on Waterway Permit
- Landholders are to be notified prior to any works and approval sought.

If accidental damage to plants occurs within the easement during operation, the following measures would be followed:

- Complete due diligence assessment
- Inform APA environment team

- FFG/EPBC permits to be obtained as required
- Remedial work would be carried out with consideration of the damaged vegetation composition as far as is practicable, and in consultation with the landholder and in accordance with any agreement made as part of easement negotiations.

### 7.7.2 Spread of invasive weeds, pathogens, pests and waste

Activities associated with maintenance, such as vehicle movement, may spread invasive weeds. Other easement maintenance tasks, such as slashing, are likely to prevent or control weed spread. The area is currently heavily infested with uncontrolled weed populations that are spread by vectors including human movement, stock, wind and vehicle movement.

During operation, spread of weeds, pathogens, pests and waste would be managed with EMM B13 (pest plant/animal/pathogen control - operation), which incorporates the following:

- Reasonable steps would be taken to prevent the growth and spread of regionally controlled weeds, eradicate regionally prohibited weeds, and prevent spread of established weed species from operation of the Project, pending consultation with landowners
- Targeted control of weeds would be undertaken by a qualified pest plant control contractor, where weeds are a direct consequence of the operation of the Project, pending consultation with landowners
- Access to works areas would be limited to easement and follow a designated access route to minimise potential for weed spread, pending consultation with landowners
- Routine inspections of easement and facilities would include reasonable steps to inspect the easement for establishment of new weed populations as a result of the Project operation, pending consultation with landowners.

Based on this, residual impacts from the spread of invasive weeds, pests and pathogens during operation of the Project are considered unlikely.

### 7.7.3 Disturbance of fauna through noise, vibration or lighting

Disturbance to threatened or non-threatened fauna as a result of noise and lighting are expected to be largely associated with any ongoing maintenance requirements for the Project and operation of the Wollert Compressor Station, which would be highly localised and minimal. Vibrations are not expected to impact on threatened fauna during operation.

EMM B14 requires light impacts on fauna are minimised in sensitive habitats and turned off when not required to reduce impacts to fauna. Noise controls are also required as part of this EMM.

### 7.7.4 Operation residual impacts summary

With the implementation of mitigation measures, residual impacts to biodiversity during operation include:

- Potential residual impacts associated with accidental clearing during operation is unlikely to impact native vegetation as the majority of the Project is located in areas of non-native vegetation
- Potential residual impacts associated with the Project spreading invasive weeds, pathogens, pests and waste are unlikely, as the construction corridor is currently heavily infested with uncontrolled weed populations spread by vectors including human movement, stock, wind and vehicle movement
- Potential, but local and minimal, residual impacts on fauna from operational noise and lighting.

## 7.8 Cumulative impact assessment

Since the majority of the construction corridor is within areas of non-native vegetation where land is currently used for agriculture or planned to be converted to housing within the MSA, the Project is not expected to have a consequential cumulative effect.

However, since native vegetation is planned to be cleared elsewhere as part of a number of planned infrastructure projects expected to occur in the region, including removal of large habitat trees, the Project will contribute to a cumulative loss of biodiversity within the region. Some of these projects are in close proximity to the Project and therefore cumulative impacts are not expected to be geographically widespread. Four other projects have been identified as potentially generating cumulative impacts relating to removal of terrestrial and aquatic species, and native vegetation and habitat within the construction corridor. These four projects are:

- Outer Metropolitan Ring transport corridor
  - Key cumulative impacts are likely to include native vegetation removal to facilitate clearing of the corridor, which covers an extensive area. Specifically, the current extent of grassland and grassy woodland vegetation communities and habitat for threatened grassland species in the broader area is likely to decrease as a result of native vegetation clearing.
- Sunbury Road upgrade
  - Key cumulative impacts may include removal of riparian woodland to facilitate the bridge upgrade/construction at Jacksons Creek (KP 14). Otherwise, native vegetation removal is expected to be minor or unlikely since construction will occur within the existing road corridor.
- Melbourne Water Bald Hill to Yan Yean pipeline
  - Key cumulative impacts may include removal of native grassland and grassy woodland vegetation. This would further reduce the extent of native vegetation, which may include listed communities and vegetation for threatened species, in the construction corridor.
- AusNet Western Victoria Transmission Network (WVTN) Project
  - Key cumulative impacts are likely to include native vegetation removal to facilitate clearing of the WVTN construction corridor, which covers an extensive area. Specifically, the current extent of grassland and grassy woodland vegetation communities in the broader area is likely to decrease because of native vegetation clearing.

## 7.9 Environmental management

### 7.9.1 Mitigation measures

APA is aiming to have as small an environmental impact footprint as practicable. However, native vegetation removal is not able to be entirely avoided due to the nature of the Project. The Project has avoided the requirement for State species offsets as a result of accurate native vegetation quantification and through revisions of the pipeline alignment.

Loss of native vegetation would be addressed through a hierarchical application of mitigation measures: firstly, avoidance; secondly, minimisation; thirdly, rehabilitation, and finally by an ecological offsetting strategy for EPBC Act and FFG Act-listed threatened species and communities, endangered EVCs and large trees where these would be directly impacted. Offsetting would be in accordance with the guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017a) and the EPBC Act. Offsetting of FFG Act-listed threatened communities is incorporated in offsets for threatened EVCs Plains Grassland and Plains Grassy Woodland.

Where practicable, steps have been taken through the design phase of the Project and the EES process to avoid or minimise impacts on biodiversity values.

#### Avoidance

Route selection and method of construction are the primary methods undertaken by the Project to avoid biodiversity impacts. A multi-criteria assessment (MCA) process selected a preferred route option from five possible options. The preferred route was selected primarily based on impacts being minimised for environment, heritage, community and land considerations.

Design refinements to the preferred route include reducing the construction footprint, re-aligning the pipeline and boring to avoid sensitive areas where possible, such as habitat suitable for protected fauna, dams and wetlands and scattered native trees and established trees along some property boundaries. Design refinements have also reduced construction footprint impacts within private properties and at waterways.

Impacts on biodiversity and habitats have been addressed throughout the design phase during pipeline alignment revisions, and have been avoided using HDD, boring and re-alignment to the maximum extent possible, given constraints around constructability and costs to the Projects. Further detail on Project constructability and considerations for HDD are in Chapter 3 *Project development*. The key outcomes of measures to avoid impacts on biodiversity are summarised in Table 7-21.

Appendix DD in Technical report A *Biodiversity and habitats* provides details of mitigation measures and constraints for all vegetation patches identified across the Project.

Table 7-21 Biodiversity avoidance measures

Biodiversity value	Avoidance measures and outcome
<b>Flora and threatened communities</b>	
Threatened – Matted Flax-lily	HDD to avoid the removal of one plant
Threatened – Tough Scurf-pea	Reduction of the construction corridor by 1.25 ha to avoid the population at Wollert Compressor Station
EPBC and FFG Act-listed Grassy Woodland, and Plains Grassy Woodland EVC	Realignment of the pipeline to avoid 2.8 ha of grassy woodland including 10 large old trees at five locations
EPBC NTGVVP, FFG Act Western (Basalt) Plains Grasslands Community and Plains Grassland	HDD or horizontal boring to avoid 0.98 ha of native grassland at five sites (Melton Highway, Calder Freeway, Mickleham Road)
<b>Groundwater Dependent Ecosystems</b>	
Deep Creek	HDD at one site to avoid 1.67 ha of Riparian Woodland and 7 trees at Deep Creek
Deep Creek	HDD at Deep Creek resulting in avoidance of impacts to 1.68 ha of a GDE
<b>Fauna</b>	
Threatened – Striped Legless Lizard	Reduction in the width of the construction corridor within the parcel (KP 10.7) that contains known Striped Legless Lizard from 0.69 ha to 0.49 ha
Threatened – Golden Sun Moth	An overall reduction in impacts through construction corridor removal and width reduction by 3.76 ha in parcels where Golden Sun Moth have been confirmed to occur
Threatened – Growling Grass Frog	HDD at Deep Creek to avoid habitat within a waterway where the species is known to occur. Reduction in the width of the construction corridor within Jacksons and Merri creeks from 30 m to 20 m. Siting of the creek crossing within Merri Creek within the existing VNIE easement to avoid degradation of new areas.
Platypus	Reduction in the width of the construction corridor within Jacksons Creek where the species is most likely to occur
General	Sections of the alignment will be co-located with existing pipeline assets within the existing APA Sunbury (KP 0–KP 9) and VNIE (KP 42–KP 51) easements. Co-location will assist with minimise additional disturbance  Boring or HDD to minimise additional disturbance to vegetation and/or habitat at Melton Highway, Holden Road, Calder Freeway, Duncans Lane, Morefield Court, Sunbury Road, Deep Creek, St Johns Road, Oaklands Road, Craigieburn Road, Mickleham Road, Donnybrook Road, Hume Freeway, North Eastern Rail line  A minor reduction in extent of the construction corridor within Conservation Area 34a – Northern Growth Corridor at KP 42.5–KP 43.3 from 2.49 ha to 2.39 ha



## Minimisation

Impacts on biodiversity and habitats as a result of construction and operation of the Project would be minimised through application of Project-specific environmental management measures, discussed in sections 7.6 and 7.7 and described in detail in Section 7.9.2. The environmental management measures are a combination of the initial and additional mitigation measures for the design, construction and operation of the Project.

## Rehabilitation and restoration

The pipeline would be located within existing and new easements to allow maintenance activities, protection of the asset from inappropriate development and as a means of ensuring the safe operation of the pipeline network.

APA would undertake rehabilitation in accordance with the environmental management measures described in Section 7.9.2, particularly EMM B7. Following completion of APA's rehabilitation requirements, developers and/or land owners in urban areas would undertake landscaping as required in accordance with the APA Site Planning and Landscape National Guidelines (APA 2020).

Post-construction revegetation would be undertaken in line with safety legislative requirements, such as ensuring unobstructed views between pipeline indicator markers and avoiding impact on subterranean pipe infrastructure and likely future pipeline routes. To promote establishment of native vegetation and habitat after construction, in situ regeneration is the preferred method of site rehabilitation to allow for genetic preservation of indigenous vegetation and maximise species diversity.

In line with site-specific rehabilitation objectives, habitat features removed during construction such as large hollow logs and large rocks or rock piles would be returned to the construction area during rehabilitation. Supplementary planting may occur if required and where statutory requirements allow. Landholder requirements would be considered prior to supplementary planting or returning habitat features to the construction area.

Special consideration will be given regarding known and assumed Golden Sun Moth habitat, which would be revegetated with appropriate native grasses that provide habitat and food sources.

Soil surfaces that have been compacted due to construction activities, such as those subject to traffic and/or storage areas within the site, would be ripped to allow the topsoil to bind with the subsoil and increase water filtration, as appropriate, prior to revegetation with indigenous native species (except in areas of known or assumed Golden Sun Moth or Striped Legless Lizard habitat).

Specific topsoil management would also be employed in areas of Golden Sun Moth habitat where the topsoil would be removed and separated from the sub-soil. The same topsoil would be replaced regardless of the pre-construction vegetation species composition. This would aim to return Golden Sun Moth larvae that may reside in the topsoil back into the construction corridor.

## Offsets

This section outlines the offsets that are proposed to compensate for Project impacts on threatened ecological communities, endangered EVCs, threatened flora and threatened fauna habitat, large trees and scattered trees.

### Commonwealth offsets

Offsets that are expected to be triggered under the EPBC Act are based on residual impacts on two species (the Golden Sun Moth and Striped Legless Lizard), and two threatened ecological communities (Natural Temperate Grassland of the Victorian Volcanic Plain and Grassy Eucalypt Woodland of the Victorian Volcanic Plain).

Commonwealth offsets in the form of required hectares would be secured to the satisfaction of the Victorian Minister for Planning in accordance with the bilateral agreement between the Commonwealth and State governments in place for the Project. The preference is to secure an offset site suitable to meet all the species and TEC offset requirements. As State offset requirements would be met through purchase of offset credits, it is not relevant to consider harmonisation<sup>20</sup> of Commonwealth and State offsets.

Further detail on how offsets would be secured, managed and monitored are included in the Ecological Offset Strategy for the Project (refer EES Attachment II) and an Offset Management Plan to be prepared for the Project's offset site. Refer to EES Attachment II *Ecological Offset Strategy* for further detail.

#### What are offsets?

For this Project, offsets are required under both Commonwealth legislation (EPBC Act) administered by DAWE, and State legislation administered by DELWP. Offsets compensate for biodiversity losses as a result of impacts on native vegetation or habitat for threatened species or communities.

A native vegetation offset consists of a site that protects existing patches of native vegetation and large trees, and could involve planting new native vegetation. Offset owners secure and manage offset sites to improve native vegetation condition.

There are two types of State offsets:

**General offsets:** required when the removal of native vegetation does not have significant impact on habitat for rare or threatened species.

**Species offsets:** required when the removal of native vegetation has a significant impact on habitat for a rare or threatened species. This offset must compensate for the removal of that species' habitat.

The gains that offsets deliver are measured in habitat units (State) and hectares (Commonwealth).

### State offsets

Removal of endangered EVCs and large trees would be managed through an offsetting arrangement in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP, 2017a). Offsets for the loss of FFG Act-listed communities will be addressed through same process.

A total of 5.475 general habitat units are required to be offset. These sites are required to be located within the Port Phillip and Westernport CMA or Hume City, Melton City, Mitchell Shire and Whittlesea City Council areas.

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<sup>20</sup> In some cases where offset site purchase is required for both Commonwealth and State offset requirements, this can be achieved collectively with one site. This is referred to as harmonised offsets.

The offsets are required for native vegetation that includes a mapped endangered EVC and 19 large trees. These losses do not currently trigger species offsets. An avoidance and minimisation strategy would aim to reduce offsets for large trees. Where greater than 10 per cent of the tree protection zone falls within the construction corridor, an arborist's assessment would be conducted to determine expected actual losses for native trees. Trees deemed not to be lost would be removed from the total loss calculations for native vegetation.

The Project is anticipated to be able to satisfy all offset requirements through purchase of offset credits. The Ecological Offset Strategy outlines how the Project can satisfy offset requirements. Refer to EES Attachment II *Ecological Offset Strategy* for further detail.

### Environmental Mitigation Levy

The MSA Levy Act applies to areas declared by the Secretary of the DELWP as a levy area. The levy area covers the four growth corridors within the expanded 2010 Urban Growth Boundary, including the construction corridor within the MSA area. The levy to offset the loss or deemed loss of particular listed threatened species habitat and/or native vegetation covers all offset obligations with the exception of conservation areas identified in the BCS, which are subject to alternative offsetting arrangements as required by DELWP.

The liability to pay an MSA levy is triggered when a levy event occurs within the levy area, where habitat compensation obligations have not been previously met. The Project has the potential to trigger two levy events:

- Issue of a Statement of Compliance for a plan of subdivision (that is, subdivision of land)
- Construction of utility infrastructure on Crown land.

The construction corridor does not intercept any Crown land subject to the levy.

The construction corridor intercepts 0.01 hectare of the levy type Golden Sun Moth where land associated with MLV 3 (Gunn's Gully Road) would be acquired as a subdivision.

Details on the MSA Levy applicable to the Project are included in EES Attachment II *Ecological Offset Strategy*.

## 7.9.2 Environmental management measures

Table 7-22 lists the environmental management measures (EMMs) relevant to biodiversity.

The environmental management measures were developed to manage and mitigate identified potential biodiversity impacts. A total of 19 environmental management measures relating specifically to expected impacts during construction have been developed to avoid or minimise risks on biodiversity and habitats from construction of the Project. Additionally, three environmental management measures have been recommended to avoid or minimise any further impacts during operation of the Project. One environmental management measure applies to both construction and operation. Development of the environmental management measures has incorporated the mitigation hierarchy described in Section 7.9.1, which lists each phase of the mitigation hierarchy and describes how impacts have been avoided in further detail.

Environmental management measures from other technical reports have also been drawn on to minimise impacts on biodiversity and habitats. These are mentioned throughout sections 7.6 and 7.7, and also in Section 13 of Technical report A *Biodiversity and habitats*.

Table 7-22 Biodiversity environmental management measures

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B1	<p><b>Vegetation management (construction)</b></p> <ul style="list-style-type: none"> <li>• Confine all vegetation clearing works to the defined construction area</li> <li>• Minimise loss of native vegetation particularly the EPBC Act-listed communities through detailed design and construction planning including reducing the width of the construction corridor where practicable, in particular at environmentally sensitive locations</li> <li>• Clearly demarcate all buffer zones, no-go zones, tree protection zones, and the boundary of the construction area prior to relevant works commencing</li> <li>• Install and maintain temporary fencing along the construction footprint boundary in areas adjacent to sensitive environmental values. The Matted Flax Lily and Tough Scurf-Pea would be protected by temporary fencing (eg star pickets and wire fencing or galvanized temporary construction fencing). For works within conservation areas of the MSA (ie near KP 43 and 49) fencing must be compliant with relevant DELWP guidelines specific to these areas</li> <li>• Clearly demarcate and identify on site all environmental features to be retained within or directly adjacent to the construction corridor, prior to relevant works commencing</li> <li>• Any necessary trimming of tree branches located on the edge of the construction corridor and overhanging into construction/activity areas must be carried out by a qualified arborist</li> <li>• Develop and implement a Tree Management Plan (B23).</li> </ul>	Design/ Construction	Avoid Minimise
B2	<p><b>Pest plant/animal/pathogen control (construction)</b></p> <p>Implement the following measures during construction to manage biosecurity risks and address <i>Catchment and Land Protection Act 1994</i> (CaLP Act) obligations:</p> <ul style="list-style-type: none"> <li>• Locate CaLP Act-listed weeds in the construction corridor and assess the risk of additional spread prior to relocating topsoil. Implement measures to manage this risk during clear and grade, and reinstatement</li> <li>• To a reasonable extent practicable during the clear and grade phase, ensure that vehicles and plant are free of soil clumps and sods prior to entry and exit from the construction corridor</li> <li>• Evaluate disturbed areas post-construction and implement remedial measures as required within a reasonable timeframe</li> <li>• Manage waste in accordance with EMM C7.</li> </ul> <p>Pathogen control</p> <ul style="list-style-type: none"> <li>• All vehicles and plant undertaking construction works directly in the watercourse (Merri and Jacksons Creeks) must be cleaned, free of soil sods and sprayed with bleach prior to entrance of each waterway and on exit if working between multiple waterways (excluding vehicles and plant using the constructed access route).</li> </ul>	Construction	Minimise Rehabilitate

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B3	<p><b>Contractor awareness</b></p> <p>Before commencing site work, all Project personnel must attend an induction that outlines environmental management requirements including:</p> <ul style="list-style-type: none"> <li>No-go zones</li> <li>Biodiversity values of the construction corridor, specifically areas of native vegetation and threatened species habitat</li> <li>Habitat and fauna awareness</li> <li>Location of other environmentally sensitive areas</li> <li>Native vegetation removal regulations and penalties for non-compliance</li> <li>EPBC Act and FFG Act regulations and penalties for non-compliance.</li> </ul>	Construction	Avoid Minimise
B4	<p><b>GDE mitigation</b></p> <ul style="list-style-type: none"> <li>Engage an arborist to assess the potential for long-term impacts on native trees based on the expected timeframe for dewatering, depth to which water is modelled to be drawn down, and the proximity of the trees to identified and potential GDEs</li> <li>Develop and implement a Tree Management Plan (B23)</li> <li>Salvage aquatic and terrestrial fauna during open trench construction dewatering activities within Jacksons and Merri creeks. Measures are to include salvage and relocation protocols which must be outlined within the CEMP and include details regarding: <ul style="list-style-type: none"> <li>Within waterways, undertake checks for the species during dewatering to remove any individuals found</li> <li>Install fauna-proof fencing along the edge of the terrestrial works area once habitat has been made unsuitable and cleared of individuals to prevent individuals recolonising for the period between clearing and construction</li> <li>Handling and relocation protocols, eg animal storage, hygiene controls</li> <li>Locations of suitable habitat (within 100 m for terrestrial fauna and 200 m for fish) to relocate any individuals found</li> <li>A protocol for any individuals found where appropriate release habitat is not available within 100 m or 200 m of capture (dependent on species)</li> <li>Means of treatment or disposal for any individuals injured or killed by works.</li> </ul> </li> </ul> <p>Measures to manage impacts to GDEs are described in EMM GW1 and EMM GW2.</p>	Construction	Minimise
B5	<p><b>Lighting impacts to fauna</b></p> <p>Design and manage lighting in accordance with best practice lighting design as outlined within the National Pollution Guidelines for Wildlife (DAWE, 2020) where these do not conflict with construction safety.</p> <p>Where lighting is required, avoid unnecessary light spill into surrounding areas that provide habitat for threatened fauna as far as reasonably practicable.</p>	Construction	Minimise
B6	<p><b>Noise impacts to fauna</b></p> <p>Construction noise and vibration must be managed in accordance with the requirements identified in EMM NV1 and NV2.</p>	Construction	Minimise

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B7	<p><b>Site rehabilitation after construction</b></p> <ul style="list-style-type: none"> <li>Reinstate the construction corridor with consideration of native vegetation composition indigenous to the area as applicable to site conditions, adjacent ground surface levels, and in consultation with the landholder and in accordance with any agreement made as part of easement negotiations</li> <li>In known and assumed Golden Sun Moth and Striped Legless Lizard habitat that contain native patches of grassland, revegetate areas with appropriate native grass seed mix (eg Wallaby Grass, Spear Grass, Kangaroo Grass) that provide habitat and food sources. On private property this will be in consultation with land owners</li> <li>Rehabilitation of construction areas and all temporary facilities, temporary access tracks and extra works areas would begin as soon as practicable after the completion of the construction activities, with the aim of restoration of ground cover within six months. Rehabilitation activities are estimated to take approximately three months. Any applicable replanting will be undertaken within 12 months of construction completion (subject to seasonal requirements).</li> </ul> <p>Subject to landholder agreement the following requirements to return habitat features to the construction area will be considered:</p> <ul style="list-style-type: none"> <li>Return habitat features removed during construction such as large hollow logs and large rocks or rock piles to the construction area during rehabilitation if consistent with rehabilitation objectives at a particular location</li> <li>Rip soil surfaces that have been compacted due to construction activities, such as those subject to traffic and/or storage areas within the site, to allow the topsoil to bind with the subsoil and increase water filtration, as appropriate, prior to revegetation with indigenous native species. Do not rip areas that are either known or assumed Golden Sun Moth or Striped Legless Lizard habitat and/or contained patches of native vegetation prior to construction</li> <li>Measures to rehabilitate Jacksons Creek as set out in EMM SW7 (Develop appropriate control measures as part of the CEMP for open trench construction) and EMM SW8 (Site rehabilitation (Jacksons Creek)) will be implemented</li> </ul> <p>Subject to Melbourne Water works on waterway permit conditions, rehabilitation of Jacksons Creek and Merri Creek will take into consideration appropriate instream and terrestrial reinstatement of habitat with regard to Platypus and Growling Grass Frog habitat.</p>	Construction	Minimise

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B8	<p><b>Topsoil management</b></p> <p>Topsoil imported to site from external locations must be free of weeds and pathogens. Stockpiled topsoil removed from weed-infested sites for the Project must only be re-used, as far as reasonably practicable, in the location that it was originally sourced from. Stockpiled topsoil from weed-infested sites may be reused where soil is sourced from sites supporting Golden Sun Moth where larvae may be present</p> <p>Stockpiled topsoil from weed-infested sites must not be re-spread over threatened species habitat or where native vegetation is to be reinstated</p> <p>For impacted areas that are Golden Sun Moth habitat:</p> <ul style="list-style-type: none"> <li>• In areas that are to be disturbed temporarily (ie, reinstated after construction) and that require topsoil removal, the period between pre-trenching topsoil removal and post-trenching topsoil replacement must be minimised to the extent practicable</li> <li>• Where the removal of topsoil is unavoidable appropriate measures to remove, separate (from sub-soils) and replace topsoils in the construction corridor must be undertaken. As far as reasonably practicable, topsoil will be progressively reinstated</li> <li>• Manage dust during the Golden Sun Moth flying season (November to January) in properties that are known or assumed Golden Sun Moth habitat to minimise impacts of dust on flying individuals as per requirements in EMM AQ1.</li> </ul>	Construction	<p>Avoid</p> <p>Minimise</p> <p>Rehabilitate</p>

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B9	<p><b>Fauna management</b></p> <p>Measures to mitigate impacts on native fauna must be developed and will be incorporated into a Fauna Management Plan. This must include the following requirements:</p> <ul style="list-style-type: none"> <li>• Woody vegetation, trees and hollows to be removed must be inspected for fauna by a suitably qualified wildlife handler immediately prior to removal. Measures to mitigate impacts on fauna must include: <ul style="list-style-type: none"> <li>– A walk-through/visual inspection of habitat to be removed immediately prior to clearance to flush out fauna and capture and relocate</li> <li>– Wildlife handler to be present during hollow-bearing tree removal and habitat removal for Growling Grass Frog and Striped Legless Lizard</li> <li>– Wildlife handler to provide advice, which must be implemented, that minimise fauna impact, and detailing appropriate measures to manage injured wildlife.</li> </ul> </li> <li>• Keep records of all fauna interactions, listing the species encountered, date, nature and outcome of the interaction and GPS coordinates. All fauna records will be submitted to the Victorian Biodiversity Atlas</li> <li>• Trench management: Work areas, particularly excavations and trenches left open overnight, must be visually inspected by a suitably qualified wildlife handler for fauna at the start of each work day. Any trapped fauna to be removed prior to work commencing. Measures are to include egress points along the trench to allow fauna to escape the trench when unattended, protocols for trapped fauna removal and provision of in-trench shelters for sections left open overnight</li> <li>• Native fauna are to be captured, handled and relocated only by a qualified and authorised fauna handler. All fauna handling must be in line with a Wildlife Act Permit Management Authorisation and any conditions within. It is an offence under the <i>Wildlife Act 1975</i> to handle or disturb fauna without authorisation</li> <li>• Records of all fauna relocations must be kept</li> <li>• Records of all fauna deaths or injuries to be kept and reported to DELWP</li> <li>• Exposed pipe ends must be capped each night to prevent fauna entry</li> <li>• Prepare and implement Kangaroo management for areas where connectivity for fauna movement will be restricted during construction</li> <li>• Temporary strainer assemblies and gateways must be installed at every fence line that is intersected by the construction corridor in agreement with the landowner and in accordance with construction specifications. This must provide security for farmstock during construction. Temporary security fencing must be installed around the construction site in all public open spaces to prevent unauthorised access to the right of way (ROW) and for public safety. When it is determined that there is no further safety risk to members of the public all security fencing will be removed</li> </ul> <p><b>For all threatened fauna:</b></p> <p>Any threatened species found within the construction site and needing relocation to avoid harm or death must be relocated to the nearest available suitable habitat. Details of suitable locations and a protocol for release for any locations where this is expected to be in excess of 100 m from the point of capture is required.</p>	Design/ Construction	Minimise



EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B10	<p><b>Surface water sedimentation and runoff</b></p> <p>Manage surface water sedimentation and runoff risks and impacts in accordance with EMM SW4 and EMM SW5.</p>	Construction	Minimise
B11	<p><b>Surface water contamination</b></p> <p>Manage chemicals, fuels and hazardous materials in accordance with EMM C6 to mitigate impacts on ecological values.</p>	Construction	Minimise
B12	<p><b>Native vegetation management - operation</b></p> <p>Minimise any chance of accidental damage to vegetation during operation by complying with the requirements in the VTS OEMP and obtaining state and federal permits and approvals as required, if accidental damage to native vegetation occurs within the easement during operation.</p>	Operation	Minimise
B13	<p><b>Pest plant/animal/pathogen control - operation</b></p> <p>Develop and implement weed and pest management in accordance with the VTS OEMP. This must include:</p> <ul style="list-style-type: none"> <li>• Taking reasonable steps to prevent the growth and spread of regionally controlled weeds and diseases including Weeds of National Significance (WoNS), to eradicate regionally prohibited weeds, and to prevent spread of established pest species within the construction corridor</li> <li>• Targeted control of weeds undertaken by a qualified pest plant control contractor pending consultation with landowners</li> <li>• Limiting access to works areas to the easement and following a designated access route to minimise potential for weed spread, in consultation with landowners</li> <li>• Routine inspections of the easement and facilities including vegetation and weed inspection, in consultation with landowners.</li> </ul>	Operation	Minimise
B14	<p><b>Noise, vibration, lighting (operation) impacts on threatened and non-threatened fauna</b></p> <p>Minimise noise, dust and lighting impacts on sensitive habitats and fauna by:</p> <ul style="list-style-type: none"> <li>• Turning off lighting when not required</li> <li>• Setting speed limits and drive conditions to minimise noise and dust impacts</li> <li>• Limiting access to easement and designated access routes to minimise erosion and associated dust.</li> </ul> <p>Design and manage lighting in accordance with best practice lighting design as outlined within the National Light Pollution Guidelines for Wildlife (DAWE, 2020) where these do not conflict with safety.</p> <p>Where lighting is required, consideration will be given to avoid unnecessary light spill into surrounding areas that provide habitat for threatened fauna.</p>	Operation	Minimise
B15	<p><b>Reinstate native vegetation</b></p> <p>Where natural regeneration of species in situ is not feasible, revegetate the area utilising seed or nursery stock obtained from within the local area, to support preservation of native vegetation values within the broader area.</p>	Construction	Rehabilitate

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B16	<p><b>Additional site assessment and management - construction</b></p> <p>Any vegetation clearing or damage to plants outside the construction corridor that occurs accidentally or without prior approval must be reported as an incident and works must cease immediately. The accidental clearing area must be subject to:</p> <ul style="list-style-type: none"> <li>• Botanical surveys to assess and map the condition and extent of native vegetation</li> <li>• If site based information of the native vegetation can no longer be observed, DELWP mapped data must be used to determine offset requirements</li> <li>• The extent and condition of accidental vegetation removal must be reported to the relevant authority as soon as reasonably practicable</li> <li>• A qualified arborist must assess any damage to trees and must identify tree protection zones (TPZs) and SRZs</li> <li>• All native vegetation to be retained must be demarcated via fencing, so no-go zones are clearly delineated and noted by workers, and any further accidental loss of vegetation is avoided.</li> <li>• Install and maintain temporary fencing along the construction footprint boundary in areas adjacent to sensitive environmental values. For works within conservation areas of the MSA (ie near KP 43 and 49) fencing must be compliant with relevant DELWP guidelines specific to these areas</li> </ul>	Construction	Minimise
B17	<p><b>Barriers to fish passage and/or migration</b></p> <p>Minimise the creation of a barrier that impedes native fish passage and/or migration and the time required for installation of the pipeline during open trench construction across Jacksons Creek and Merri Creek by using the following approaches:</p> <ul style="list-style-type: none"> <li>• Assemble and prepare the pipeline so it can be installed as soon as reasonably practicable once trenching through the watercourse is complete</li> <li>• Remove all obstructions to flow and passage as soon as reasonably practicable after the pipeline has been laid and backfilled. That is, with the exception of the flume pipe at Merri Creek, which may not be immediately removed after the pipe has been laid</li> <li>• Reinststate the exposed trench within the watercourse and riparian zones as soon as reasonably practicable following the installation of the pipeline</li> <li>• Works on a designated watercourse must have a permit for Works on Waterways from Melbourne Water. All works must be completed in accordance with permit requirements.</li> </ul>	Construction	Minimise Rehabilitate

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B18	<p><b>Value-specific mitigation</b></p> <p>Develop and implement specific measures to protect EPBC Act and/or FFG Act communities that are impacted, including:</p> <ul style="list-style-type: none"> <li>• Measures required by EMM B1</li> <li>• Establishing no-go areas around plant populations</li> <li>• Install and maintain temporary fencing along the construction footprint boundary in areas adjacent to sensitive environmental values. For works within conservation areas of the MSA (ie near KP 43 and 49) fencing must be compliant with relevant DELWP guidelines specific to these areas</li> <li>• Marking any significant values such as large old trees on site plans</li> <li>• An arborist's assessment to establish no-go areas around retained large old native trees close to the construction corridor</li> <li>• On-site supervision by a botanist and/or arborist to avoid accidental damage to retained native vegetation during construction works in GEVVVP</li> <li>• Retention of stockpiled vegetation to be used for site rehabilitation</li> <li>• Rehabilitating disturbed areas as soon as reasonably practicable</li> <li>• A Tree Management Plan must be prepared based on detailed construction drawings and surveyed tree locations (EMM B23).</li> </ul>	Construction	Avoid Minimise Rehabilitate
B19	<p><b>Fauna Mitigation – Golden Sun Moth</b></p> <p>Prepare and implement a Golden Sun Moth Management Plan and obtain approval for the plan from DELWP. The plan must include details regarding:</p> <ul style="list-style-type: none"> <li>• Location of Golden Sun Moth habitat and method for mitigation measures in these areas</li> <li>• Topsoil management (including as outlined within EMM B8)</li> <li>• Rehabilitation measures</li> <li>• Ongoing management and/or monitoring.</li> </ul>	Construction	Minimise Rehabilitate

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B20	<p><b>Fauna Mitigation – Striped Legless Lizard</b></p> <p>Prepare and implement a Striped Legless Lizard Management Plan and obtain approval for the plan from DELWP. The plan must include the following measures:</p> <ul style="list-style-type: none"> <li>• Undertake active searching of areas identified as Striped Legless Lizard habitat (including rock rolling and lifting debris) prior to slashing</li> <li>• Slash areas of known and assumed habitat one week prior to tyning, to make them less suitable for lizards and encourage lizards to vacate the construction area. Slashing heights to be limited to no lower than 50 mm to minimise risk to individuals</li> <li>• If tyning is delayed, areas may need to be re-slashed to keep the grass short</li> <li>• Tyne areas of known and assumed habitat immediately prior to trenching to salvage and relocate individuals to immediately adjacent suitable habitat</li> <li>• A suitably qualified wildlife handler would be present during all tyning activities to undertake salvage and relocation activities</li> <li>• Once habitat has been made unsuitable and tyning has been completed, install lizard-proof fencing along the construction site boundary (where it meets lizard habitat) to prevent individuals from recolonising the site during construction. Fencing must be a solid material (eg polyethylene sheeting or plastic) that is 400 mm high and dug into the ground at a depth of 100 mm</li> <li>• Develop a record-keeping, storage, treatment and/or disposal protocol for killed or injured individuals, in accordance with DELWP advice. All such records will be reported to DELWP</li> <li>• Management of topsoil as per EMM B7 and B8 is also required.</li> </ul>	Construction	Minimise

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B21	<p><b>Fauna Mitigation – Growling Grass Frog</b></p> <p>Schedule construction within Jacksons Creek outside the species' peak active period (November to March).</p> <p>Prepare and implement a salvage and relocation plan for areas identified as habitat for the Growling Grass Frog and obtain approval for the plan from DELWP. The salvage and relocation plan must include details regarding:</p> <ul style="list-style-type: none"> <li>• Making habitat unsuitable for Growling Grass Frog by slashing bank vegetation one week prior to construction to discourage individuals from remaining within the site</li> <li>• Undertaking checks for the species immediately prior to construction to remove any individuals found</li> <li>• For dams proposed for removal that have been identified as habitat, install fauna-proof fencing around the waterbodies once habitat has been made unsuitable and cleared of individuals to prevent individuals recolonising for the period between clearing and construction</li> <li>• For waterways identified as habitat, install fauna-proof fencing along the edge of the terrestrial works area once habitat has been made unsuitable and cleared of individuals to prevent individuals recolonising for the period between clearing and construction</li> <li>• Install fauna-proof fencing within 100 m of areas with habitat known or assumed to support Growling Grass Frog</li> <li>• Handling and relocation protocols eg animal storage, hygiene controls</li> <li>• Locations of suitable habitat (within 100 m) to relocate any individuals found</li> <li>• A protocol for any individuals found where appropriate release habitat is not available within 100 m of capture</li> <li>• Means of treatment or disposal for any individuals injured or killed by works. All deaths or injuries to be recorded and reported to DELWP</li> <li>• Fauna-proof fencing for Growling Grass Frog will be of a suitable structure and material to prevent frog movement from one side of the fence to the other</li> <li>• Minimise the risk of high flow events on Growling Grass Frog habitat through site-specific measures outlined in EMM SW7 and EMM SW9 including but not limited to timing of works, Flood Management Plan and Response Plans.</li> </ul>	Construction	Minimise

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B22	<p><b>Fauna Mitigation – Platypus</b></p> <p>Protect Platypus in accordance with the Platypus Management Guidelines (Australian Platypus Conservancy <a href="https://platypus.asn.au/management-guidelines/">https://platypus.asn.au/management-guidelines/</a>). This must include:</p> <ul style="list-style-type: none"> <li>• A pre-construction survey for the presence of burrows within the construction corridor at Jacksons Creek where open trench construction is to occur</li> <li>• If the presence of burrows can't be ruled out, the construction works at Jacksons Creek waterway/banks will be timed to avoid the peak juvenile nesting period between September and beginning of March</li> <li>• If burrows are observed or can't be ruled out, excavations should proceed carefully using a non-toothed excavator bucket (eg mud or batter bucket) in order to allow any individuals present to escape</li> <li>• Minimise, where practicable, activities that involve excavating or driving over banks with heavy machinery and limit these to areas within the construction corridor</li> <li>• To avoid disturbing active Platypus, schedule work activities during daylight hours in Jacksons Creek. This excludes the use of pumps to extract water from the construction footprint overnight. Locate pumps as far from the waterway as reasonably practicable with use of noise deflectors to minimise noise impacts</li> <li>• All pumps and pipes to include exclusion grill to prevent Platypus becoming trapped, injured or killed</li> <li>• Egress points should be installed to allow any trapped individuals to escape coffer dams</li> <li>• Install exclusion fencing around coffer dams to reduce risks of predation on Platypus travelling around the coffer dams overland</li> <li>• Manage loose soil from moving from the banks to the channel while works are underway. Areas of bare or disturbed soil are to be replanted as soon as reasonably practicable once works are completed and in accordance with landowner agreements</li> <li>• Implement measures to prevent chemicals or litter associated with work activities from entering waterways and drainage lines</li> <li>• To maintain natural foraging substrates for Platypus, concrete must not be substantially used as a binding agent along surface areas of the channel or banks. This does not include the subsurface concrete encasement of slab protection considered for pipe protection as part of EMM SW7</li> <li>• Develop and implement a contingency plan for dealing with any Platypus that may be accidentally injured or displaced during work activities.</li> </ul>	Construction	Minimise

EMM #	Environmental Management Measure	Stage	Mitigation hierarchy
B23	<p><b>Remnant Tree Management Plan</b></p> <p>Develop and implement a Tree Management Plan to identify all remnant native (non-planted) trees within 15 m of the construction corridor boundary, deemed “lost” through encroachment of their TPZs and specifies:</p> <ul style="list-style-type: none"> <li>• Trees to be impacted as part of the construction activities</li> <li>• The condition and arboricultural value of the trees.</li> </ul> <p>Maximise tree retention to the extent practicable through detailed design and selection of construction methods to minimise canopy loss including by retaining trees where practicable and minimising potential impacts to trees.</p> <p>Arboricultural assessments must inform the Tree Management Plan in order to maximise tree retention and long-term viability of individual trees including those deemed “lost” through encroachment of their TPZs or groundwater changes.</p> <p>The Tree Management Plan must be informed by a pre-construction site assessment to confirm the area and number of trees proposed to be impacted. The area and number of trees actually removed are to be confirmed through a post-construction arborist assessment.</p>	Construction/ Operation	Avoid Minimise

### 7.9.3 Monitoring

In addition to the Offset Management Plan that would be finalised prior to construction (refer Section 7.9.1), the residual impacts on threatened flora and vegetation from the Project would be managed and evaluated through the development and implementation of a monitoring program. Details of the monitoring program are below:

**Baseline data:** Baseline environmental conditions for botanical, fauna and aquatic ecology are described in Section 7.3 and Technical report A *Biodiversity*.

#### Monitoring of biodiversity values on and near the construction corridor

**Objective:** Evaluate the residual impact of the Project on botanical values and effectiveness of reinstatement and provide recommendations for management as required.

**Indicators:** Following reinstatement after Project construction and considering offsets, biodiversity values equal to or better than the baseline conditions.

**Monitoring requirements:** A comprehensive body of baseline survey data exists that would be used as a benchmark to evaluate the residual impact of the Project on botanical values. To monitor potential adverse residual effects on flora and vegetation, the monitoring program would:

- Set objectives for vegetation recovery using baseline data (reinstated vegetation should meet or exceed the condition of pre-construction vegetation)

- Prior to construction, undertake an inspection to identify and mark out and fence off the location of the Tough Scurf-pea population at the Wollert Compressor Station site. The fencing will be maintained during construction. An inspection will occur post-construction to assess the population of Tough Scurf-pea at the Wollert Compressor Station site and determine the likelihood of any adverse impacts from construction, or any other changed conditions that may impact its survival
- Prior to construction, undertake an inspection to identify and mark out and fence off the location of the Matted Flax-lily located at Craigieburn road reserve. The fencing will be maintained during construction. Following construction, an inspection will be carried out to confirm survival of the Matted Flax-lily and evaluate the effectiveness of protection during construction. This inspection will occur at the conclusion of the construction works in the proceeding springs (when it is flowering and most visible)
- Evaluate the progress of reinstatement toward achieving key performance indicators
- Routine inspections of the easement and facilities would be undertaken in accordance with the OEMP VTS and in consultation with landowners (EMM B13).
- At the end of the monitoring period evaluate whether monitoring should be extended
- Provide recommendations for management as required.

**Locations and frequency:** EMM B2 requires the evaluation of disturbed areas post-construction, and that remedial measures be implemented as required within a reasonable timeframe.

### Monitoring of biodiversity offsets to be established

**Objective:** Monitor offset condition and compliance with offset requirements.

**Indicators:** As defined in the Offset Management Plan.

**Monitoring requirements:** An offset strategy has been prepared to address the EPBC Act Environmental Offsets Policy (DSEWPAC 2012) and the policy objectives of the guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017a). Monitoring or audit requirements will be defined in the Offset Management Plan. Three methods of monitoring, frequency and parameters would be outlined within the Offset Management Plan when it is developed. These are:

- Independent annual monitoring to inform the annual compliance reports to be provided to DAWE by APA (unless otherwise advised by the Minister)
- Continuous monitoring undertaken by the Offset Landowner to understand general site conditions
- Independent audits undertaken by the approval holder (APA) as defined in the Offset Management Plan and agreed with DAWE.



## Aquatic ecology values

To monitor the performance of management measures in protection of waterways health and biodiversity values, EMM SW5 requires monitoring of waterways where open trench construction is planned (refer to the environmental management measures listed in Chapter 8 *Water* and Technical report B *Surface water*). In general, this requires:

- Undertaking biological and water quality monitoring of Jacksons Creek and Merri Creek prior to construction based on EPA publication 793.2 *Biological Objectives for Rivers and Streams - Ecosystem Protection* (2004). This would be undertaken at sites upstream and downstream of the waterway crossings to establish background conditions
- Following completion of construction, the biological and water quality monitoring would be repeated to determine if there are ongoing or residual impacts.

In addition, as per EMM B22, a survey for the presence of burrows within the construction corridor on Jacksons Creek would be undertaken prior to open trench construction.

Should monitoring determine adverse residual impacts on biodiversity values, contingency measures would be implemented such as:

- Identifying, repairing or redesigning failed management measures aimed at reducing impacts due to erosion and sedimentation
- Further stabilising banks and beds at waterway crossings to reduce erosion potential and sedimentation.

### 7.9.4 Contingency measures

Any adverse residual effects on flora, fauna and ecological community values requiring further management would be assessed on a case-by-case basis and responses developed to address specific issues. Accidental clearing of vegetation or habitat during construction is primarily addressed by EMM B16 (Additional site assessment and management – construction), as well as EMM B7 (Site rehabilitation after construction) and EMM B15 (Reinstate native vegetation). During operation, accidental clearing or damage to vegetation or habitat is addressed by EMM B12 (Vegetation management – operation).

A majority of the environmental management measures employed for the Project are standard construction measures used on typical projects with expected or known likely outcomes. Where there is uncertainty in the effectiveness of any given measures, additional mitigation has been recommended to reduce risk of such uncertainty on biodiversity values or values have been assumed to be impacted and offset accordingly. Refer Section 14.2.4 in Technical report A *Biodiversity*.

### 7.10 Conclusion

This chapter has identified and assessed existing conditions, impacts and mitigation on flora, fauna and aquatic ecology values for the Project. Based on a desktop assessment and a field investigation program, the quality of native vegetation, terrestrial fauna and aquatic values within the construction corridor is generally poor due to the long history of agricultural and urban land use in the surrounding landscape, which has led to disturbance. Nonetheless, construction and operation of the Project will impact some biodiversity values present within the construction corridor, while some impacts on biodiversity values have been avoided as a result of pipeline re-alignment and construction techniques.

Two species of threatened flora (Matted Flax-lily *Dianella amoena* and 48 Tough Scurf-pea *Cullen tenax*), ten large River Red Gum trees within a TEC, 2.7 hectares of grassy woodland (EPBC/EVC/FFG) and 1.26 hectares of grassland (EPBC/EVC/FFG), 1.24 hectares of known and assumed Striped Legless Lizard habitat (outside of the MSA) and 4.08 hectares ha of known or assumed Golden Sun Moth habitat (outside of the MSA) will be avoided through pipeline re-alignment and use of horizontal directional drilling (HDD).

Notable ecological values which are potentially impacted by the Project as a result of land clearing include erosion, sedimentation, dust and contamination, spread of weeds, pathogens or pests, and groundwater drawdown.

The Project traverses two conservation areas approved under Part 10 of the EPBC Act. This includes Conservation Area 34a - Northern Growth Corridor, where the extent of the construction corridor within the conservation area is 2.39 hectares, and 0.59 hectares excluding the existing easement. This also includes Conservation Area 28b - Summerhill Road (East), where the extent of the construction corridor within the conservation areas is 1.78 hectares, and 0.53 hectares excluding the existing easement.

Direct vegetation loss is expected of:

- 15.32 hectares (including time-stamped vegetation mapping) of native vegetation in patches from six EVCs; 12 large trees within patches; 16 large scattered trees, and 16 small scattered trees
- 4.16 hectares of EPBC Act-listed threatened community Natural Temperate Grassland of the Victorian Volcanic Plain (0.73 hectares inside the approved MSA area and 3.43 hectares outside the MSA area)
- 2.26 hectares of EPBC Act-listed threatened community Grassy Eucalypt Woodland of the Victorian Volcanic Plain (0.06 hectares inside the approved MSA and 2.20 hectares outside the MSA area)
- 10.36 hectares of FFG Act-listed threatened community Western (Basalt) Plains Grasslands Community (1.38 hectares inside the approved MSA area and 8.98 hectares outside the MSA area)
- 4.62 hectares of FFG Act-listed threatened community Western Basalt Plains (River Red Gum) Grassy Woodland (0.32 hectares inside the approved MSA area and 4.30 hectares outside the MSA area).

The Project is likely to have a significant impact (based on EPBC Act significance criteria) on EPBC Act TEC Grassy Eucalypt Woodland of the Victorian Volcanic Plain based on five criteria, and is also likely to have a significant impact on TEC Natural Temperate Grassland of the Victorian Volcanic Plain based on two criteria.

Habitat for Arching Flax-lily is expected to be removed during construction. However, since the population consists of only a single plant, the population is likely to be unviable in the longer term and the overall impact to the species is considered minor.

Some of the habitats that would be affected are known to or may support threatened fauna, mainly the higher quality grassland areas and waterways. Impacts on threatened fauna are expected to be limited to four species: Golden Sun Moth, Striped Legless Lizard, Growling Grass Frog and Tussock Skink. With a majority of the construction corridor comprising grassland habitats, it is the Golden Sun Moth and Striped Legless Lizard that are expected to experience the greatest impacts of land clearance, with respective totals of 19.93 hectares and 39.34 hectares of known or potential habitat expected to be impacted.

The Project is likely to have a significant impact (based on EPBC Act significance criteria) on EPBC Act listed Striped Legless Lizard and Golden Sun Moth.

Impacts as a result of noise, vibration and lighting are expected to be minimal as they are highly localised to the narrow construction corridor.

Impacts have been minimised as far as practicable. However, since vegetation removal would occur, any further reduction on the residual impacts has not been achievable. Areas that are disturbed during construction would be reinstated.

Unavoidable loss of TECs and threatened species habitat would be managed through Commonwealth offsetting as required under the EPBC Act.

Removal of endangered EVCs, including native vegetation and large trees would be managed through an offsetting arrangement in accordance with the Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017a) when suitable offsets have been identified and are available. Offsets for the loss of FFG Act-listed communities would be addressed through offsets for endangered EVCs Plains Grassland and Plains Grassy Woodland. An Ecological Offset Strategy (refer EES Attachment II) has been prepared and identified offsets are currently readily available for purchase.

Indirect impacts on botanical values are expected to be minor and temporary during construction and operation of the Project. Indirect impacts on threatened flora and ecological communities or non-threatened flora may occur from erosion/sedimentation, dust, litter, release of contaminants or soil compaction. A range of environmental management measures developed with other relevant disciplines has been recommended to maximise the likelihood of these impacts being temporary and minor.

Noxious weeds are ubiquitous throughout the Study Area, including within the construction corridor. Further spread of weeds/pest animals/pathogens during construction and operation would be managed through environmental management measures incorporated into the CEMP.

Dewatering drawdown is likely to be temporary, minor and localised, and impacts on GDEs are likely to be insignificant. Refuge pools in Merri Creek, considered GDEs and those considered to provide important habitat during low flow or drought conditions are outside the expected area where groundwater drawdown would occur and not likely to be impacted. These would be managed through environmental management measures for construction, dewatering impacts on groundwater and development, and implementation of a tree management plan included in the CEMP.

Indirect impacts on fauna habitat may occur from erosion/sedimentation, dust, litter or release of contaminants into wetland and waterways. A range of environmental management measures recommended by other relevant disciplines would maximise the likelihood of these impacts being temporary and minor.

Project construction at night would require adequate lighting, which may disturb or displace native or non-native fauna. Efforts would be made to minimise the escape of light during the Project's construction with measures developed to minimise light spillage to protect significant native fauna habitat to the extent practicable. Disturbance of some fauna by light is unavoidable but is expected to be minor and localised. Similarly, noise and vibration impacts are expected to be highly localised and short term, moving with the construction front. The implementation of noise and vibration environmental management measures requires noise and vibration be managed and outlined within the CEMP.

The risk of habitat fragmentation is low. The loss of habitat connectivity associated with the Project is expected to be temporary, localised, and minimal for most species. Habitat fragmentation would be minimised through Project design, measures to avoid accidental loss of habitat, and contractor awareness. Reinstatement of vegetation and topsoil management within the construction corridor would allow continued passage of fauna and help reduce the long-term effect of additional habitat fragmentation.

Indirect impacts on aquatic ecology values are expected to be minor and temporary during the Project's construction and operation. The majority of aquatic habitats intersected by the pipeline were deemed highly unlikely to support EPBC Act or FFG Act-listed species. While there was a medium likelihood of Australian Grayling being present in Deep Creek, impacts on the species are largely avoided through the use of HDD.

The recently FFG Act-listed Platypus is known to exist in Jacksons Creek and have been observed in close proximity to the construction corridor. Although there is a direct risk of injury or death of Platypus due to open trench construction, the risk has been minimised or avoided through the implementation of a Platypus-specific environmental management measure. A range of environmental management measures have also been developed to manage risks from indirect impacts that may occur due to impacts on water quality and habitat conditions.

Application of Project environmental management measures will avoid or minimise impacts on biodiversity and habitats during construction and operation, and include requirements for monitoring against baseline data. Proposed environmental management measures include measures to manage vegetation and fauna during construction, control of pest organisms, manage runoff and erosion, enhance contractor awareness, mitigate GDE impacts, reinstatement and rehabilitation measures and threatened species impact mitigation.

With the implementation of mitigation measures, residual impacts on biodiversity and habitats during construction as a result of land clearing, noise, vibration, lighting and other construction activities, have been minimised where practicable, as described above. During operation, residual impacts on biodiversity and habitats associated with accidental clearing, spread of invasive weeds, pathogens, pests and waste, and operational noise and lighting, are considered to be unlikely and managed by the VTS OEMP.

In response to the EES evaluation objective described at the beginning of this chapter, effects of the Project on biodiversity have been assessed and environmental management measures have been identified to minimise or avoid impacts on flora, fauna and aquatic values, and manage any residual impacts to biodiversity values.