VICTORIAN PLANNING AUTHORITY

AUGUST 2020

FLORA AND FAUNA ASSESSMENT

WALLAN EAST PRECINCT

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Flora and Fauna Assessment
Wallan East Precinct

Victorian Planning Authority

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A	01/05/2020	Draft for comment
B	18/06/2020	Revision including targeted survey results and client comments
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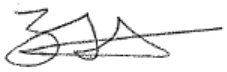
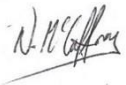
Prepared by:	Zoë Steven	13/08//2020	
Reviewed by:	Nic McCaffrey	13/08//2020	
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DELWP for access to the Victorian Biodiversity Atlas (VBA) database and Biodiversity Interactive Maps.

Commonwealth Department of Agriculture, Water and Environment (DAWE) for access to its Protected Matters Search Tool (PMST).

GLOSSARY AND ABBREVIATIONS

DELWP Advisory listing	Department of Environment, Land, Water and Planning (DELWP) Advisory list of rare or threatened flora and fauna.
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: — Genetic diversity — the variety of genes (or units of heredity) in any population. — Species diversity — the variety of species. — Ecosystem diversity — the variety of communities or ecosystems.
Bioregion (region)	A bioregion defined in a national system of bioregionalisation. The majority of the Study Area falls within the Central Victorian Uplands bioregion with smaller areas covered by the Victorian Volcanic Plain bioregion.
Canopy tree	See 'Native Canopy Tree'.
CMA	Catchment Management Authority (area).
Department of Environment, Land, Water and Planning (DELWP)	This department was formerly known as: — Department of Environment and Primary Industries (DEPI) — Department of Planning, Local Government, and Property and Land Titles (DTPLI).
Department of Agriculture, Water and the Environment (DAWE)	The department develops and implements national policy, programs and legislation to protect and conserve Australia's natural environment and cultural heritage and administers the EPBC Act. The Commonwealth Department of the Environment was previously known as: — Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) — Department of the Environment, Water, Heritage and the Arts (DEWHA) — Department of Environment and Heritage (DEH) — Department of the Environment and Water Resources (DEWR) — Department of Environment and Energy (DoEE).
DBH	Diameter at Breast Height. The diameter of the main trunk of a tree measured over bark at 1.3 m above ground level.
Drip Line	The outermost boundary of a tree canopy (leaves and/or branches) where the water drips onto the ground.
Ecological community	An assemblage of species occupying a particular area.
Ecological Vegetation Class (EVC)	A type of native vegetation classification that is described through a combination of its floristics, life form and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities (i.e. lower level in the classification that is based solely on groups in the same species) that occur across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.
EES	Environment Effects Statement
Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.

EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
Exotic	Introduced from outside the area (Ensbey & Johnson 2009) used in the context of this report to refer to species introduced from overseas.
FFG Act	State *Flora and Fauna Guarantee Act 1988*.
GPS	Global Positioning System – a navigational tool which uses radio receivers to pick up signals from four or more special satellites to provide precise determination of location.
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic components.
Habitat Hectare	A site-based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type.
Habitat score	The score assigned to a habitat zone that indicates the quality of the vegetation relative to the EVC benchmark – sum of the site condition score and landscape context score usually expressed as a percentage or as a decimal fraction of 1.
Habitat Zone	A discrete area of native vegetation consisting of a single vegetation type (EVC) with an assumed similar quality. This is the base spatial unit for conducting a habitat hectare assessment.
Indigenous	Native to the subject area: not exotic.
Introduced	Not native to the area: not indigenous. Refers to both exotic and non-indigenous Australian native species of plants and animals.
Likely	Taken to be a real chance or possibility.
Local population	The population that occurs within the site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated.
Locality	The area within a 10 km radius of the site.
Location Category	There are three location categories that indicate the potential risk to biodiversity from removing a small amount of native vegetation. These location categories are identified by DELWP as follows: — Location 3: includes locations where the removal of less than 0.5 hectares of native vegetation could have a significant impact on habitat for a rare or threatened species. — Location 2: includes locations that are mapped as endangered EVCs and/or sensitive wetlands and coastal areas (section 3.2.1) and are not included in Location 3. — Location 1: includes all remaining locations in Victoria.
Modelled wetlands	Modelled wetlands may or may not be visible on the ground and are treated as a patch of native vegetation for the purpose of offsets unless they are covered by a hardened, man-made surface, for example, a roadway. Modelled wetlands are defined by DELWP.

Matters of National Environmental Significance (MNES)	The following Matters of National Environmental Significance are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act): listed threatened species and communities, listed Migratory species, Ramsar wetlands of international importance, Commonwealth marine environment, World Heritage Properties, National Heritage Places, the Great Barrier Reef Marine Park and nuclear actions.
Migratory species	Species listed as Migratory under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 relating to international agreements to which Australia is a signatory. These include Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Capitalisation of the term 'Migratory' in this report refers to those species listed as Migratory under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
Native Canopy Tree	A native canopy tree is either: – a mature tree (able to flower) that is greater than three metres in height and is normally found in the upper layer of the relevant vegetation type (EVC); or – a standing dead tree (stag) if it has a trunk diameter of 40 centimetres or more at a height of 1.3 metres above the ground.
Native Vegetation	Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'.
No Net Loss	An outcome where a particular gain in the contribution to Victoria's biodiversity is equivalent to an associated loss in the contribution to Victoria's biodiversity from permitted clearing.
Noxious weed	An introduced species listed under the *Catchment and Land Protection Act 1994* Under the Act, noxious weeds have specific control measure and reporting requirements.
NVPP	Native Vegetation Precinct Plan
Offset	Protection and management (including revegetation) of native vegetation at a site to generate a gain in the contribution that native vegetation makes to Victoria's biodiversity. An Offset is used to compensate for the loss to Victoria's biodiversity from the removal of native vegetation. Offsets are to be secured in perpetuity with an on-Title conservation covenant.
Offset target	The amount of Offset required, measured in Habitat Units, to ensure permitted clearing of native vegetation results in no net loss in the contribution made by native vegetation to Victoria's biodiversity.
P&E Act	*Planning and Environment Act 1987*

Patch of native vegetation	A patch of native vegetation is either: – an area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native; or – any area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy; or – any mapped wetland included in the current wetlands layer available in Native Vegetation Information Management (NVIM) and other DELWP systems.
Potentially Threatening Processes	The state equivalents of Key Threatening Processes, Potentially Threatening Processes are listed under Section 10 of the *Flora and Fauna Guarantee Act 1988* (FFG Act).
Project area	The areas for which planning approvals are sought as part of the project.
Protected species	Those species defined as protected under the *Flora and Fauna Guarantee Act, Environment Protection and Biodiversity Conservation Act* or DELWP Advisory Lists.
PSP	Precinct Structure Plan
Ramsar	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
Recovery plan	A plan prepared under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* to assist the recovery of a Threatened species, population or ecological community.
Recruitment	The production of new generations of plants, either by allowing natural ecological processes to occur (regeneration etc.), by facilitating such processes, or by actively revegetating (replanting, reseeding). See revegetation.
Revegetation	Establishment of native vegetation to a minimum standard in formerly cleared areas, outside of a Remnant Patch
Scattered trees	A scattered tree is a native canopy tree (see 'Native Canopy Tree' above) that does not form part of a patch. Scattered trees have two sizes, small and large: – a small scattered tree is less than the large tree benchmark for the species in the relevant EVC – a large tree is equal to or greater than the large tree benchmark for the species in the relevant EVC – a standing dead tree that does not form part of a patch is treated as a large scattered tree if it has a trunk diameter of 40 centimetres or more at a height of 1.3 metres above the ground.
Significant	Important, weighty or more than ordinary; typically used to describe the importance of a species or community at local, regional, state or federal levels.
Species – General Offset Test	The species-general offset test measures the proportional impact from the removal of native vegetation on the habitat of rare or threatened species, according to the Habitat importance maps, and compares this to the species offset threshold.

Species Offset	A Species Offset is required when the removal of native vegetation has a significant impact on habitat for a rare or threatened species. Species Offsets must compensate for the removal of that particular species' habitat.
Species richness	Species richness is simply the number of species present in a sample, community, or taxonomic group. Species richness is one component of the concept of species diversity, which also incorporates evenness, that is, the relative abundance of species.
spp.	Abbreviation of *species plural*
sp.	Abbreviation of *species*
Strategic Biodiversity Value (SBV)	The Strategic Biodiversity Value is a rank of a location's complementary contribution to Victoria's biodiversity, relative to other locations across the state with regard to its condition, extent, connectivity and the support function it plays for species.
ssp.	Abbreviation for *subspecies*
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as Threatened) under the DELWP's Advisory listings, the FFG Act, or EPBC Act. Capitalisation of the terms 'Threatened', 'Vulnerable', 'Endangered' or 'Critically Endangered' in this report refers to listing under the relevant state and/or Commonwealth legislation.
Tree Protection Zone (TPZ)	Calculated area (based on AS 4970-2009 (Protection of trees on development sites)) of soil volume required to encompass sufficient absorbing tree root systems to ensure the long-term survival of a tree. Calculated as (12 x DBH) of the tree. Trees may be considered as lost (and may require an Offset) if impacts of greater than 10% intrusion into the TPZ occur.
Weed	A plant growing out of place or where it is not wanted: often characterised by high seed production and the ability to colonise disturbed ground quickly. Weeds include both exotic and Australian native species of plant naturalised outside of their natural range.

EXECUTIVE SUMMARY

WSP Australia Pty Limited (WSP) conducted a flora and fauna assessment of the proposed Wallan East Precinct, consisting of a desktop and a field assessment undertaken in November and December 2019. The aim of this assessment was to determine the ecological values present, to assess likely impacts and subsequent regulatory and legislative implications. This report will also inform and support the development of a native vegetation precinct plan (NVPP).

STUDY AREA

The study area is approximately 140 ha located to the east of the Wallan town centre, 50 km north of Melbourne. It is within Mitchell Shire Council, and within the Victorian Volcanic Plains bioregion. The study area currently consists of low-density rural housing and agricultural land utilised for grazing.

METHODS

WSP completed the mapping and assessment of native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (The Guidelines) (DELWP 2017a). Native vegetation patches were mapped and assigned an appropriate Ecological Vegetation Class (EVC). Scattered tree locations were recorded with a handheld GPS and a diameter measurement was taken.

Targeted surveys were conducted for the critically endangered Golden Sun Moth *Synemon plana* as per the Commonwealth survey guidelines (DEWHA 2009) with four surveys being undertaken within the summer survey period.

Targeted surveys were undertaken for Southern Toadlet and Brown Toadlet during the Autumn calling period for these species. The surveys were undertaken using the call playback method by two ecologists over two nights, 6 and 7 May 2020.

RESULTS

The assessment found a total of 4.59 ha of native vegetation across the study area from four Ecological Vegetation Classes (EVC) and 35 scattered trees. The vegetation in general was in poor condition with low species diversity and high weed cover.

No Golden Sun moth were observed during targeted surveys and are now not considered likely to occur.

No Southern or Brown Toadlets were recorded during targeted surveys.

No other listed fauna, flora or communities were recorded within the study area.

ECOLOGICAL IMPACTS

WSP have proposed a retention area to protect a large proportion of the native vegetation along Merri Creek. The remaining vegetation with potential to be impacted is 3.268 ha of treeless Plains Swampy Woodland and Aquatic Herbland.

LEGISLATION

No matters of National Environmental Significance were recorded within the study area or considered likely to occur.

The Flora and Fauna Guarantee Act does not apply to private land. A 'Permit to Take' will be required for flora species protected under the FFG Act if removed from public land, for example the roadsides. Several Black Wattles are present in the roadsides that are listed as protected species. However most roadside vegetation should be avoidable by locating any entrances to the precinct away from patches of native vegetation.

The requirement for an Environmental Effects Statement is unlikely to be triggered by the project, as none of the individual criteria was met.

The project will require offsets under the *Planning and Environment Act 1987* for all native vegetation impacted. Offsets will be calculated once the final native vegetation losses are determined after further avoid and minimise workshopping with the VPA.

Eight weed species listed under the CaLP Act 1994 were found within the study area. The landholder must take all reasonable measures to prevent their spread and control these weed species both during and after construction.

RECOMMENDATIONS

It is recommended that the amount of native vegetation retained across the study area is finalised in consultation with WSP and the VPA, based on the proposed precinct design and biodiversity retention priorities. Further increases in retention from the area proposed in this report will reduce the required biodiversity offsets.

Potential areas for habitat restoration and revegetation have been proposed, including along Merri Creek.

1 INTRODUCTION

WSP Australia Pty Limited (WSP) was engaged by the Victorian Planning Authority (VPA) to prepare a Flora and Fauna Assessment report and Native Vegetation Precinct Plan to inform precinct planning and development of the Wallan East Precinct. The biodiversity assessment report will be used by the VPA to inform the future development of the Precinct Structure Plan (PSP) area, in particular, assisting in decision-making around the retention, removal and/or offsetting and native vegetation and fauna habitat.

WSP undertook this flora and fauna assessment as per Section 1.2 of the Biodiversity Precinct Planning Kit (DSE 2010). The Biodiversity assessment is the first stage of the assessment, with stage two being the development of the Native Vegetation Precinct Plan which will follow further consultation with VPA regarding vegetation retention.

The objectives of the assessment, as per the Biodiversity Precinct Planning Kit (DSE 2010), are to:

1. Identify, assess and map significant flora, fauna, and habitat in the study area.
2. Collect data at sufficient detail and standard that enables a Precinct Structure Plan and Biodiversity Plan to be developed.
3. Ensure environmental values identified are integrated with the planning and development of the Precinct.
4. Ensure proposed development in the precinct is, where possible, designed to reduce the potential impact on biodiversity values and to suggest mitigation actions.
5. Provide advice on any works or management measures that may reduce adverse impacts of the development on species known or likely to occur in the Precinct.
6. Ensure that development of the precinct is able to comply with Government legislative and policy requirements on the protection of indigenous fauna and flora species and Communities.

1.1 PROJECT SCOPE

The following scope of work was defined for the project:

- Desktop review of flora and fauna databases and relevant biodiversity strategies, policies and legislation.
- Review previously completed preliminary assessments.
- Map native vegetation as per the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a) for native vegetation patches, scattered trees and other relevant environmental features. Assess mapped as native vegetation were scored as per the Habitat Hectare methodology (DSE 2004).
- Conduct fauna habitat assessments and undertake a targeted survey for the Golden Sun Moth.
- Assess the likelihood of threatened flora and fauna and communities listed under *the Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Flora and Fauna Guarantee Act 1988* (FFG Act), and the Victorian Advisory Lists of threatened flora and fauna (DEPI 2014; DSE 2013).
- Evaluate the potential ecological impacts and recommend mitigation measures, specifically with practical recommendations to avoid, minimise or mitigate and offset ecological impacts.
- Evaluate implications of relevant biodiversity policy and legislation, and triggers for permits (including FFG Act permit and EPBC Act referral).
- Consideration of biodiversity values, reporting and recommendations for the purposes of informing the development of a Native Vegetation Precinct Plan (NVPP) as per *Preparing a Native Vegetation Precinct Plan* (DELWP 2017b).

1.2 STUDY AREA

The study area for this assessment is the proposed Wallan East Precinct Structure Plan area proposed by VPA, as defined by the cadastral boundaries of the properties included within the precinct. It is the area for which planning approvals for the development of the Wallan East Precinct will be sought and is shown in Appendix C. A glossary on Page vii provides definitions of terms used throughout this report.

Wallan East Precinct is an area of approximately 140 hectares located to the east of Wallan town centre. The study area is bounded by the rail corridor in the east, Epping Kilmore Road in the west, Kelby Lane in the north and Wallan Whittlesea Road in the south (See Mapping in Appendix C).

The study area currently consists of low density rural housing and agricultural land utilised for grazing.

The study area is approximately 50 km north of Melbourne, within Mitchell Shire Council, and the Victorian Volcanic Plains bioregion. The traditional owners of the land within the study area are the Wurundjeri People.

2 METHODOLOGY

2.1 PERSONNEL

The contributors to this study, their qualifications and Project roles are provided in Table 2.1.

Table 2.1 Contributors and their roles

NAME	QUALIFICATIONS	POSITION AND ROLE/S ON PROJECT
Justin Pegg	BSc, M. Env&Sus	Senior Ecologist – Project Manager, field survey
Nic McCaffrey	BSc	Principal Ecologist – Ecology project director, field survey
Zoë Steven	BSc Hons, M. Env	Senior Ecologist – Field survey and reporting
Danelle Scicluna	BEnvSc	Graduate Ecologist – Field survey and desktop assessment
Timothy O'Donnell	Senior Spatial Consultant	GIS Technician, mapping and data management

2.2 DATABASE AND LITERATURE REVIEW

A database search and literature review were undertaken for an indication of the ecological values of the study area, and potential constraints to the project. Relevant and available documents were reviewed for information on past land uses, presence of vegetation communities as well as flora and fauna. Relevant databases were searched for records of threatened species within a five-kilometre radius of the study area.

This review was used to prepare a list of threatened flora and fauna species, ecological communities, and any significant habitat previously recorded or predicted to occur in the study area and the broader locality (listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Flora and Fauna Guarantee Act 1988* (FFG Act). The following sources of information were consulted:

- The Department of Environment, Land, Water and Planning (DELWP) NatureKit online tool (DELWP 2018b)
- The Victorian Biodiversity Atlas – five-kilometre radius of the study area
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool – five kilometre radius of the study area (DoEE 2019a)
- The Commonwealth Department of the Environment and Energy Species Profile and Threats Database
- Victorian Rare or Threatened Species Advisory Lists (DEPI 2014; DSE 2009, 2013)
- The Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a)
- Native Vegetation Information Management System (DELWP 2020)
- Vegetation Quality Assessment Manual (DSE 2004)
- Publicly available and supplied reports including:
  - Preliminary (Desktop) Biodiversity Assessment, Ecology and Heritage Partners, 2015
- Aerial imagery to determine habitat extents and linkages
- Relevant legislation, government policy and strategies including:
  - *Preparing a Native Vegetation Precinct Plan* (DELWP 2017b)
  - *Biodiversity Precinct Planning Kit* (DSE 2010).

2.3 FLORA SURVEY

Site assessments for flora and vegetation were undertaken across eight days in November and December 2019 to determine the type and extent of native vegetation present, habitat resources available, and the possible impacts to biodiversity values. The following techniques were utilised:

- field validation of vegetation modelling – the extent and condition of native vegetation was mapped and assessed against the most appropriate EVC benchmark
- habitat hectare assessments were completed for all habitat zones identified within the study area in accordance with the '*Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method Version 1.3'* (DSE 2004)
- assessment of habitat for threatened flora to inform likelihood of occurrence
- any other incidental observations, or evidence of flora or fauna were recorded.

The specific methods used to survey vegetation and flora are detailed below.

2.3.1 CATEGORISING VEGETATION WITHIN THE STUDY AREA

Field validation (or ground-truthing) of extant vegetation modelling (DEPI 2009) and vegetation mapping was undertaken for the assessment of native vegetation as per the *Guidelines for the removal, destruction or lopping of native vegetation* (the Guidelines) (DELWP 2017a).

Native vegetation is defined in planning scheme as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. The Guidelines further classify native vegetation as a patch or a scattered tree as per the following.

A patch of native vegetation is:

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

A scattered tree is a native canopy tree that does not form part of a patch.

The locations of scattered trees were recorded with a handheld GPS (accuracy +/- 3 m) where they did not meet the criteria for a remnant patch. Tree data collected by the project arborist was provided to WSP. The dataset used in the mapping for this report is a combination of data collected by WSP and the arborist.

2.3.2 REVEGETATION

Revegetation is extensive across the study area and was mapped in revegetation polygons. Individual planted trees were not mapped. Vegetation surrounding houses that was clearly planted for amenity (e.g. garden beds) was not mapped, or were mapped broadly, however some older indigenous trees within gardens were recorded where they appeared to be remnant.

Where revegetation of non-indigenous species had occurred within remnant patches, such as along the creek banks, these species were considered in the weed score of a habitat hectare assessment. Where the percentage of non-indigenous species accounted for over 75% of total vegetation cover, those areas were not included as part of the patch.

2.3.3 HABITAT HECTARE ASSESSMENTS

Habitat hectare assessments were undertaken on remnant patches of native vegetation to determine the condition of the vegetation in the context of the local area and the relevant bioregions. This methodology is outlined in *Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method* (DSE 2004). The habitat hectare method involves making visual and quantitative assessments on various characteristics of native vegetation according to established criteria that are set against an optimum benchmark. This process aims to establish the significance of native vegetation through an objective and repeatable methodology using working documents (benchmark data and field assessment score sheets) that are uniformly applied across Victoria.

In summary, this process begins with the identification of the EVC. Each EVC has a benchmark of optimal values which are found on DELWP's website (DELWP 2018a). Site assessments are undertaken using the DSE *Vegetation Quality Field Assessment Sheet* (Version 1.3 October 2004) (DSE 2004). Further to the site condition criteria, the habitat hectare process also requires an assessment of the site in a landscape context (DSE 2004).

If a site meets or exceeds all benchmark criteria it will receive a total score of 100, which is a total of the above condition and landscape scores in pristine undisturbed condition. However, in many cases in the urban-influenced ecosystems, sites receive a score less than 60, due to their relatively high level of modification. The final habitat score is presented as a percentage and then converted to a score out of 1.00.

2.4 FAUNA SURVEY

2.4.1 HABITAT ASSESSMENT

Fauna habitats were assessed by examining characteristics such as the structure and floristics of the canopy, understorey and ground vegetation, the structure and composition of the litter layer, and other habitat attributes important for feeding, roosting and breeding.

2.4.2 GOLDEN SUN MOTH TARGETED SURVEY

Golden Sun Moth *Synemon plana* are a critically endangered species that is found in grassland and grassy woodland habitats west and north of Melbourne into NSW and the ACT. The larvae feed off the roots of native Wallaby Grasses *Rytiodosperma* spp. and Spear Grass *Austrostipa* spp., as well as the introduced Chilean Needle Grass **Nassella neesiana*. Patches of vegetation dominated by these species within the known range for the Golden Sun Moth require a targeted survey. Several suitable patches of Wallaby Grass were mapped on a property at 25 Kelby Lane.

The Department of Agriculture, Water and Environment (DAWE) produce survey guidelines for key threatened species in order to maximise detection and reduce the chances of the survey producing a false negative result (DEWHA 2009). Surveys for Golden Sun Moth need to be conducted during the flying season which varies from year to year but is generally between late October and early January. Surveys need to be undertaken four times, approximately a week apart, under the following conditions:

- warm day (above 20 degrees by 10 am)
- between 10 am and 2 pm
- clear or cloudless sky
- still or relatively low winds
- at least 2 days since rain.

Prior to conducting surveys, a reference check was undertaken at a location where the moths have previously been recorded. The property at 1470 Old Sydney Road where Biosis had recorded moths flying in 2017 (Biosis 2017) was used as reference check location. Moths were recorded flying at the reference location prior to each survey.

Table 2.2 Golden Sun Moth survey dates and details

SURVEY DATA	SURVEY 1	SURVEY 2	SURVEY 3	SURVEY 4
Date	5/12/2019	9/12/2019	13/12/2019	17/12/2019
Temp ˚C	21	28	18	26.5
Wind Speed (km/h)	28	32	22	28
Cloud Cover (%)	10	5	10	10
1470 Old Sydney Road (reference site)	Multiple moths flying	Multiple moths flying	Multiple moths flying	Multiple moths flying
25 Kelby Lane	0 moths	0 moths	0 moths	0 moths

2.4.3 TOADLET TARGETED SURVEYS

Targeted surveys for Brown Toadlet *Pseudophryne bibronii* and Southern Toadlet *Pseudophryne semimarmorata* were undertaken on 6 and 7 May 2020. These species are found under rocks, logs or leaf litter in forests near creeks, gutters or ditches that are inundated after rain. The calling period for both species is Autumn (ARC 2020). Both species have very high numbers of records within 5 km of the project area. Surveys for these species were recommended in the first version of this report. It has since been updated to include the results.

The survey was undertaken by two ecologists over two nights. It involved walking along the creek line and around dams within the study area where potential habitat exists, listening for calls and then doing call playback for both species through a speaker and listening for responses. Survey data is provided in Table 2.3 below.

The survey included parts of Merri Creek along the northern and southern boundary of the study area, plus several farm dams in the south eastern part of the study where previous records exist.

Table 2.3 Toadlet targeted survey data

SURVEY DATA	SURVEY 1	SURVEY 2
Date	6/05/20	7/05/20
Time	6:30 – 8 pm	6:30 – 8 pm
Start Temperature	12.3 °C	13.2 °C

2.5 LIKELIHOOD OF OCCURRENCE

The presence or absence of a particular species cannot be definitively determined during a relative short survey timeline. For this study, the likelihood of occurrence of threatened and migratory species and populations was determined based on the criteria shown in Table 2.4 below. This method identifies the habitat requirements of the species, outcomes of a habitat assessment, the state of habitat connectivity, records of historical and recent presence as identified in the Victorian Biodiversity Atlas (VBA), and modelled presence from the Protected Matters Search Tool (PMST).

Table 2.4 Likelihood of occurrence criteria for threatened flora and fauna species

LIKELIHOOD	DESCRIPTION
Low	Species considered to have a low likelihood of occurrence include species not recorded during the field surveys that fit one or more of the following criteria: — have not been recorded previously in the study area and surrounds and for which the study area is beyond the current distribution range — rely on specific habitat types or resources that are not present in the study area — are considered locally extinct — are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
Moderate	Species considered to have a moderate likelihood of occurrence include species not recorded during the field surveys that fit one or more of the following criteria: — have infrequently been recorded previously in the study area and surrounds — use habitat types or resources that are present in the study area, although generally in a poor or modified condition — are unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically during variable seasons or migration — are cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
High	Species considered to have a high likelihood of occurrence include species not recorded that fit one or more of the following criteria: — have frequently been recorded previously in the study area and surrounds — use habitat types or resources that are present in the study area, that are abundant and/or in good condition within the study area — are known or likely to maintain resident populations surrounding the study area — are known or likely to visit the site during regular seasonal movements or migration.
Recorded	Any significant species recorded during field surveys.

2.6 PLANT IDENTIFICATION

Flora species that could not be identified in the field were recorded to the nearest possible family or genus. These were then collected and identified as per protocols of the Flora and Fauna Guarantee Permit (10007800) for the collection of plant material.

2.7 LIMITATIONS

A common limitation of ecological surveys is the short time period in which they are undertaken and the lack of seasonal sampling, which can lead to lack of detection of some species. The results of the field survey are indicative of the environmental conditions at the time of assessment, including the presence or otherwise of species. Also, it should be recognised that site conditions, including the presence of threatened species, can change with time.

To overcome this as much as possible, the likely presence of threatened fauna species was determined primarily through habitat assessment, which is a conservative approach likely to include species that are difficult to detect if suitable habitat was observed in the study area, and if that species was known to occur regionally.

2.8 PERMITS

All WSP staff and subcontractors are covered under the Standard Operating Procedures approved by the Department of Economic Development, Jobs, Transport and Resources, Wildlife and Small Institutions Animal Ethics Committee approval (08.17) and Victorian *Wildlife Act 1975* Research Permit (100007593). Additionally, all relevant WSP staff are covered under the Victorian *Flora and Fauna Guarantee Act 1988* Permit to take/keep protected flora (10007800).

3 RESULTS

3.1 DATABASE AND LITERATURE REVIEW

3.1.1 VBA AND PMST SEARCH RESULTS

The Victorian Biodiversity Atlas (VBA) query returned records for 10 flora and 31 fauna species of state and/or national significance within the local area (five-kilometre radius of the project area).

The Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool (PMST) returned an additional 15 fauna, and 11 flora species to that returned by the VBA that have modelled habitat in the area. The PMST also returned 13 migratory species.

Marine or pelagic species returned by database searches were not considered further due to lack of appropriate habitat. Summaries of species thought likely to occur are provided in the flora and fauna results Sections 3.2.1.1 and 3.2.2.7 respectively. A Likelihood of Occurrence Assessment is provided in Appendix A.

3.1.2 EPBC ACT LISTED COMMUNITIES

The PMST report found five listed ecological communities that return a status of likely to occur within a 5 km radius of the study area. Although listed as likely to occur on the PMST report, none were recorded during the site assessments.

Table 3.1 EPBC listed communities likely to occur

COMMUNITY	STATUS	TYPE OF PRESENCE (PMST)	PRESENCE IN STUDY AREA
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	Community known to occur within area	Not found – associated EVCs not mapped within study area
Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area	Not found – associated EVCs not mapped within study area
Natural Temperate Grasslands of the Victorian Volcanic Plain	Critically Endangered	Community likely to occur within area	Not found – grasslands in study area did not meet size and condition thresholds of this community (DSEWPaC 2011b)
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Community likely to occur within area	Not found – wetlands in study area did not meet condition requirements of this community (DoEE 2019b)
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area	Not found – associated EVCs not mapped within study area

3.1.3 EXTANT VEGETATION MODELLING

Extant vegetation modelling (DEPI 2009) indicates the presence of EVC 126: Swampy Riparian Complex modelled as present along the rail corridor and EVC 18: Swampy Riparian Forest along sections of Merri Creek which runs north south across the western side of the study area.

3.1.4 PREPARING A NATIVE VEGETATION PRECINCT PLAN

Preparing a Native Vegetation Precinct Plan (DELWP 2017b) provides guidance for the preparation of a Native Vegetation Precinct Plan (NVPP), including when to use an NVPP, the content of an NVPP, and how to implement an NVPP. Implications of this guidance document are discussed in Section 6.2.4. The NVPP will be developed following consultation with VPA on potential for native vegetation retention based on the findings of this assessment.

3.1.5 PLANNING OVERLAYS

There are no planning overlays relevant to an ecological assessment across the study area.

3.1.6 PREVIOUS REPORTS

PRELIMINARY (DESKTOP) BIODIVERSITY ASSESSMENT, WALLAN STRUCTURE PLAN, ECOLOGY AND HERITAGE PARTNERS (ECOLOGY AND HERITAGE PARTNERS PTY LTD 2015)

A desktop assessment was conducted by Ecology and Heritage Partners (EHP) in 2015 of an area comprising approximately 2,768 ha. This area includes the area that now forms the Wallan East Precinct.

This report categorised the study area into four broad habitat types:

1. Remnant Vegetation – considered to be high conservation value given the expansion of urban development in the area, likely to form important wildlife corridors within the broader landscape.
2. Planted Vegetation – including street trees plantings and garden beds, while not considered as high conservation value, still contributes to wildlife corridors, particularly for urban adapted birds.
3. Exotic Dominated Grassland – including pasture dominated by introduced species and maintained lawns and rail/road reserves, provides limited habitat value.
4. Aquatic Habitat – the Ecology and Heritage Partners study area included Merri Creek and as well as many dams, tributaries and drainage lines. Riparian vegetation condition was overall rated as low across Merri Creek and its tributaries.

Three EPBC Act listed flora and an additional three state flora listed species are known to occur within the study area for this assessment, as per records in the VBA and from data obtained from the Merri Creek Management Authority (cited in EHP 2015):

- Swamp Fireweed *Senecio psilocarpus* (EPBC – VU, VicAdv – vulnerable)
- Swamp Everlasting *Xerochrysum palustre* (EPBC – VU, FFG listed, VicAdv – vulnerable)
- Matted Flax-lily *Dianella amoena* (EPBC – EN, FFG listed, VicAdv – endangered)
- Small-flower Wallaby-grass *Rytiodosperma monticola* (VicAdv – rare)
- Pale Swamp Everlasting *Coronidium gunnianum* (VicAdv – vulnerable)
- Floodplain Fireweed *Senecio campylocarpus* (VicAdv – rare).

With the exception of Small-flower Wallaby Grass these species were all recorded in the Beveridge to Wallan Rail Reserve which is outside the study area for the Wallan South precinct.

Two EPBC Act listed fauna species and an additional six state listed species were recorded by EHP within the study area for this assessment:

- Swift Parrot *Lathamus discolour* (EPBC – CR, FFG listed, VicAdv – endangered)
- Australian Bittern *Botaurus poiciloptilus* (EPBC – EN, FFG listed, VicAdv – endangered)
- Speckled Warbler *Pyrrholaemus sagittatus* (FFG listed, VicAdv – vulnerable)
- Hardhead *Aythya australis* (VicAdv – vulnerable)
- Musk Duck *Biziura lobata* (VicAdv – vulnerable)
- Black Falcon *Falco subniger* (FFG listed, VicAdv – vulnerable)
- Royal Spoonbill *Platalea regia* (VicAdv – near threatened)
- Brown Toadlet *Pseudophryne bibronii* (FFG listed, VicAdv – endangered).

The report identifies four additional fauna species that were not recorded during the assessment but are considered likely to occur:

- Growling Grass Frog *Litoria raniformis* (EPBC – VU, FFG listed, VicAdv – endangered)
- Striped Legless Lizard *Delma impar* (EPBC – VU, FFG listed, VicAdv – endangered)
- Golden Sun Moth *Synemon plana* (EPBC – CR, FFG listed, VicAdv – critically endangered)
- Grey-headed Flying-fox *Pteropus poliocephalus* (EPBC – VU, FFG listed, VicAdv – vulnerable).

3.2 FIELD ASSESSMENT

3.2.1 FLORA

3.2.1.1 FLORA SPECIES

A total of 73 vascular plant species were recorded in the study area during the field assessment survey, of which 31 (42%) were indigenous and 42 (58%) introduced species.

A list of flora species recorded in the study area is provided in Appendix B; Table B.1.

3.2.1.2 SIGNIFICANT FLORA SPECIES

No flora species of conservation significance were recorded in the study area. Two species listed on the *Victorian Advisory list of rare and threatened plants* (DEPI 2014) were found within the study area being Spotted Gum *Corymbia maculata* and Giant Honey Myrtle *Melaleuca armilaris* subsp. *armilaris*. However, neither of these species are indigenous and would have been planted.

3.2.1.3 LISTED VEGETATION COMMUNITIES

No EPBC Act listed ecological communities were recorded within the study area. Patches of treeless Plains Swampy Woodland EVC 651 were identified within the study area consisting of only a grassy understorey, they do not meet the size and condition requirements to qualify as the equivalent EPBC Act community 'Natural Temperate Grasslands of the Victorian Volcanic Plains' (DSEWPaC 2011b). For inclusion in this community the patch must have greater than 50% cover of native grass species, which the patches of treeless Plains Swampy Woodland in the study area did not meet.

3.2.1.4 GENERAL SITE CONDITION

The majority of the study area has been cleared of native vegetation for agricultural purposes. The study area consists of low-density semi-rural residential housing, with agricultural land grazed by both cattle and sheep. There are scattered indigenous trees across the study area, and some patches of native vegetation along the creek-line and around the edges of the study area, down the rail corridor and in the road reserves. Within the grazed areas a couple of patches of indigenous grasses were mapped within the exotic grasses. Trees are planted in windrows across the study area and in landscaped gardens around the houses.

This native vegetation across the study area was attributed to the following four EVCs:

- Aquatic Herbland EVC 653
- Plains Swampy Woodland EVC 651
- Swampy Riparian Woodland EVC 83
- Tall Marsh EVC 821.

3.2.1.5 NATIVE VEGETATION MAPPING

Patches of native vegetation and indigenous scattered trees qualify for legislative protection as per the Guidelines {DELWP, 2017 #7496}. Patches of native vegetation are classified by Ecological Vegetation Class (EVC). An EVC is a

unit of consistent vegetation displaying broadly similar botanical characteristics reflecting consistent environmental and structural conditions (Oates & Taranto 2001). EVCs mapped on site and their extents and conservation statuses in the relevant Bioregions are detailed in Table 3.2. The scattered trees are detailed in Table 3.3 in Section 3.2.1.7. Mapping of native vegetation found in the study area is provided in Appendix C.

Brief descriptions of remnant vegetation are provided in Section 3.2.1.6 below.

Implications of possible clearance of mapped native vegetation is detailed and discussed in Section 4.1.

Table 3.2 Native vegetation as attributed to Ecological Vegetation Classes mapped within the study area

NUM. PATCH	EVC NUMBER	ECOLOGICAL VEGETATION CLASS	BIOREGION	BIOREGION CONSERVATION STATUS	AREA MAPPED (ha)
1	653	Aquatic Herbland	Victorian Volcanic Plains	Endangered	0.059
25	83	Swampy Riparian Woodland	Victorian Volcanic Plains	Endangered	1.077
10	651	Plains Swampy Woodland (treeless)	Victorian Volcanic Plains	Endangered	3.346
3	821	Tall Marsh	Victorian Volcanic Plains	Endangered	0.108
Total					**4.59**

3.2.1.6 EVC DESCRIPTIONS

AQUATIC HERBLAND

One patch of Aquatic Herbland was mapped within the study area with an area of 0.059 ha and a habitat hectare score of 17 (see Appendix D for full habitat hectare assessment results). The description of this EVC from the EVC Benchmarks is (DELWP 2016a):

> *"Herbland of permanent to semi-permanent wetlands, dominated by sedges (especially on shallower verges) and/or aquatic herbs. Occurs on fertile paludal soils, typically heavy clays beneath organic accumulations."*

Within the study area, this EVC is found around the edge a of dam. It is of relatively poor quality with low species diversity. It is lacking the diversity of herbs typical of this EVC, instead containing only Austral Rush *Juncus australis.*

Photo 3.1 Aquatic Herbland EVC found surrounding a dam within the study area

PLAINS SWAMPY WOODLAND

Ten patches of treeless Plains Swampy Woodland were recorded with a total of 3.346 ha across the study area. It was located within the Victorian Volcanic Plains Bioregion. The average habitat hectare score was 11. This EVC is described in the benchmarks (DELWP 2016a) as:

> *"Eucalypt woodland to 15 m tall with ground layer dominated by tussock grasses, sedges and herbs. Shrubs are often scattered throughout. Occurs on poorly drained, seasonally waterlogged heavy soils."*

The patches on site were of relatively poor quality. In the understorey, the cover of native species was low, generally 25–40%, with a high proportion of introduced grasses. Diversity was also low, with several grass species but very few herbs. These patches had been impacted by significant grazing pressure from cows and horses, as well as kangaroos. Grass species present include Slender Wallaby Grass *Rytidosperma racemosum*, Bristly Wallaby Grass *R. setaceum*, Hill Wallaby Grass *R. erianthum.* Weed species present include Flatweed *Hypochaeris radicata*, Ribwort *Plantego lanceolata*, Prairie Grass *Bromus catharticus*, Brown-topped Bent *Agrostis capillaris*, Cocksfoot *Dactylis glomerata* and many other introduced grass species.

None of the mapped patches of this EVC contained the shrub or canopy component typical of this EVC.

Many of the patches to the north of the study area off Kelby Lane, met the habitat specifications for Golden Sun Moth, including presence of Wallaby-grass and appropriate inter-tussock space. However four surveys were undertaken and no moths were detected.

Photo 3.2 Patches of treeless Plains Swampy Woodland EVC, generally supporting only 25–40% cover of indigenous grass species

SWAMPY RIPARIAN WOODLAND

Twenty-five patches of Swampy Riparian Woodland were recorded across the study area with a total area of 1.077 ha. The habitat hectare scores for this EVC ranged from 10 to 20. It is described in the benchmarks as (DELWP 2016a):

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

This EVC was present in small patches in the road reserves, often without a canopy lay, only consisting of various Wattles but sometimes including a canopy of River Red Gum *Eucalyptus camaldulensis*, Swamp Gum *E. ovata* or Manna Gum *E. viminalis*. Weeds present in the road reserves were mainly exotic grasses.

There were also patches of Swampy Riparian Woodland along the rail corridor and Merri Creek. These patches generally had a higher diversity of indigenous species, but also had a higher cover of high-treat weeds such as Gorse and Blackberry.

Photo 3.3 Patches of Swampy Riparian Woodland along Merri Creek and in the road reserve

TALL MARSH

Three patches of Tall Marsh were mapped within the study area with a total area of 0.108 ha and an average habitat hectare score of 26. The description of this EVC from the benchmarks is (DELWP 2016a):

> *"Closed to open grassland/sedgeland to 3 m tall, dominated by Common Reed and Cumbungi. Small aquatic and semi-aquatic species occur amongst the reeds. Occurs on Quaternary sedimentary geology of mainly estuarine sands, soils are peaty, silty clays, and average annual rainfall is approximately 600 mm. It requires shallow water (to 1 m deep) and low current-scour, and can only tolerate very low levels of salinity."*

The patches within the study area consisted of a dense monoculture of Common Reed *Phragmites australis*, and were found in ditches along the road reserve and rail corridor.

Photo 3.4 Tall Marsh consisting of Common Reed

3.2.1.7 TREE SUMMARY

SCATTERED TREES

Any indigenous tree not forming part of a patch was recorded as a scattered tree. A total of 35 scattered trees were recorded across the study area, none of which were large trees. The following table summarises the scattered trees present.

Table 3.3 Scattered trees

SCIENTIFIC NAME	COMMON NAME	TOTAL NUMBER
Eucalyptus camaldulensis	River Red Gum	10
Eucalyptus leucoxylon	Yellow Gum	1
Eucalyptus melliodora	Yellow Box	1
Eucalyptus ovata	Swamp Gum	5
Eucalyptus polyanthemos	Red Box	4
Eucalyptus radiata	Narrow-leaved Peppermint	1
Eucalyptus viminalis subsp. viminalis	Manna Gum	13
Total		**35**

LARGE TREES IN PATCHES

The 2017 *Guidelines* require the assessor to collect data relating to the number of large trees within patches so to ensure the offset contains a large tree for every large tree removed. No large trees within patches were recorded within the study area.

3.2.2 FAUNA

3.2.2.1 SPECIES OBSERVED

A comprehensive fauna survey was included as part of the assessment. Incidental observations of 35 fauna species were made during the field assessment. Fauna species observed are listed in Appendix B. This included 30 native and 5 introduced species, mostly species common to agricultural areas.

3.2.2.2 GOLDEN SUN MOTH TARGETED SURVEY RESULTS

Potential Golden Sun Moth habitat was mapped in a paddock off Kelby Lane within the north part of the study are. These patches had a suitable cover a Wallaby Grasses with appropriate inter-tussock spacing for the species to be considered likely habitat. Four surveys were conducted under appropriate circumstances (see Section 2.4.2). Prior to each survey a reference site was checked to ensure the species was flying that day. A property on Old Sydney Road (Part of the Wallan South study area) was used as the reference check site. Species were observed at the reference site before each survey.

No individuals were recorded flying during any survey within Wallan East. The patches of appropriate habitat were small and disconnected from other known records. The species is subsequently not considered likely to occur in the study area.

Table 3.4 Golden Sun Moth survey results

PROPERTY	SURVEY DATA	SURVEY 1	SURVEY 2	SURVEY 3	SURVEY 4
25 Kelby Lane	**Date**	5/12/19	9/12/19	13/12/19	17/12/19
	Temp ˚C	21	28	18	26.5
	Wind Speed (km/h)	28	32	22	28
	Cloud Cover (%)	10	5	10	10
	Result	Not recorded	Not recorded	Not recorded	Not recorded

3.2.2.3 SOUTHERN TOADLET AND BROWN TOADLET TARGETED SURVEY RESULTS

Brown Toadlet *Pseudophryne bibroni* is a small, secretive autumn-breeding frog found across most of south-east Australia. It usually breeds following heavy summer rains with eggs laid in small depressions (Tyler & Knight 2009) near water that will later be flooded (ARC 2020). The habitat of Brown Toadlet is typically dry forest, woodland, shrubland and grassland where they shelter in moist depressions and soaks such as drainage lines and small dams.

There are 150 records for Brown Toadlet within 5 km of the study area, including records within the study area itself. Surveys are recommended for this species where potential habitat exists along Merri Creek.

Southern Toadlet is found in damp habitats such as forests, woodlands, shrublands, grasslands and drainage channels. They shelter under leaf litter and other debris within moist soaks and depressions. Eggs are spawned in shallow burrows under leaf litter in low areas near water that will later become flooded (ARC 2020). It is classified as vulnerable and under threat due to habitat loss and drought.

There are 91 records within 5 km of the study area, however none since 1988.

Targeted surveys were undertaken on 6 and 7 May with none being recorded. These species are relatively cryptic and difficult to detect, and can be mistaken for more common species, during the early stages of calling. Lack of detection during the two surveys is not considered adequate to rule out the species presence across the site, especially considering the high number of nearby records. It is therefore recommended that further targeted surveys are undertaken in the Autumn survey season of 2021, to better inform a presence or absence determination, and give an indication of distribution across the site if present.

Table 3.5 Toadlet targeted survey results

SURVEY DATA	SURVEY 1	SURVEY 2
Date	6/05/20	7/05/20
Time	6:30 – 8 pm	6:30 – 8 pm
Temperature	12.3 °C	13.2 °C
Water	Not recorded	Conductivity 731 Ph 7.6*
Species recorded	Common froglet *Crinia signifera* Peron's Tree Frog *Litoria peronii*	Common froglet *Crinia signifera* Peron's Tree Frog *Litoria peronii*

*Data recorded from Merri Creek

3.2.2.4 FAUNA HABITAT WITHIN THE STUDY AREA

Habitat types for fauna species observed during the field assessment are described in Table 3.6 below. With the majority of the site having been cleared for agricultural purposes, fauna habitats on site were of limited value and very few fauna species recorded within the study area during assessments.

Table 3.6 Habitat descriptions

HABITAT	DESCRIPTION	VALUES
Remnant vegetation patches	Several small patches of Swampy Riparian Woodland were present across the study area. Most were small and lacking in diversity. Patches along the rail corridor and Merri Creek were better quality featuring a canopy and mid-storey layer, however the understorey was usually dominated by exotic grass species.	The small patches of native vegetation in the roadsides are likely to provide nesting and foraging habitat for common bird species. The lack of large hollow bearing trees would make these patches of relatively low quality. The patches along the creek and rail corridor contained a dense understorey, partly weedy, which would provide good shelter and nesting habitat for small birds. Overall habitat values consider low and very few fauna species observed utilising habitat during site assessments.
Highly modified open landscape	Open highly modified land utilised for agricultural purposes primarily for grazing sheep and cattle. These areas are primarily dominated by weedy exotic graminoids. This habitat type dominated the Wallan East precinct area.	These areas provide abundant foraging resources for common bird species and grazing for kangaroos.
Planted trees and shrubs	Indigenous, native and exotic trees are found planted across the study area. However none considered large and none with notable hollows. Various trees and shrubs have been planted around houses and along driveways.	As with the remnant patches, these trees may provide roosting and refuge habitat for native birds foraging and dispersing throughout the landscape. Ornamental flowering shrubs in gardens provide refuge and foraging resources for native birds. Planted non-indigenous trees across the landscape still provide important habitat connectivity across the landscape.

HABITAT	DESCRIPTION	VALUES
Dams and creeklines	Merri Creek runs through the study area. This area had high weed cover of Gorse and Blackberry. Multiple dams were scattered across the study area, some containing native fringing vegetation of rushes but some with no vegetation.	This habitat offers potential foraging and refuge for amphibians, reptiles and birds. There are a high number of records for Brown Toadlet *Pseudophryne bibronii* and Southern Toadlet *Pseudophryne semimarmorata* within 5 km of the study area. Including within the study area itself, however neither species was recorded during targeted surveys. Other listed species likely to utilise the aquatic habitat within the study area based on previous records include Hardhead *Aythya australis* and Musk Duck *Biziura lobata*.

3.2.2.5 HABITAT CONNECTIVITY

The broader landscape surrounding the study area is highly fragmented. The landscape is primarily semi-rural agricultural land with patches of remnant vegetation across only a small proportion of the landscape. In fragmented landscapes, roadside vegetation, scattered trees and even non-indigenous planted street trees can play an important role in maintaining connectivity. Linear reserves such as rail corridors and creeklines, which are present in the study area also play important roles in connectivity in degraded landscapes. Habitat within the rail corridor and along Merri Creek are in poor quality with heavy infestations of Gorse. Weed removal and restoration of the riparian zones will improve connectivity across the landscape.

3.2.2.6 PEST FAUNA SPECIES

A number of European Rabbits *Oryctolagus cuniculus* and European Hares *Lepus europaeus* were seen across the project area. Rabbits and Hares are classified as established pest animals under the CaLP Act. The reduction in biomass and biodiversity of native vegetation through grazing by Rabbits is listed as a threatening process under the FFG Act. The dense Gorse along Merri Creek, particularly in the southern sections of the study area provides shelter for Rabbits. This area is part of the recommended retention area and rabbit population control and/or rabbit proof fencing should be considered in additional to removal of Gorse as part of the restoration of this area.

3.2.2.7 LIKELIHOOD OF OCCURRENCE ASSESSMENT

Following the field assessment, the likelihood of occurrence of species returned in the Victorian Biodiversity Atlas query and the Protected Matters Search Tool query detailed in section 3.1.1 was assessed. Species of conservation significance considered moderately or highly likely to occur across the study area are listed below. Many species with high numbers of nearby records were ruled out following the site assessment based on lack of appropriate habitat on site. Brown Toadlet and Southern Toadlet both have records in the VBA within the study area itself. Surveys for these species were recommended in the first version of this report (April 2020). These surveys were undertaken during the Autumn calling period but none were recorded. The likelihood has been revised back down to moderate. The species may still be present in low numbers that were not detected during surveys.

The complete likelihood of occurrence assessment is provided Appendix A.

Table 3.7 Summary of species of conservation significance considered at least moderately likely to occur following site assessment

SCIENTIFIC NAME	COMMON NAME	EPBC ACT	VIC ADV	FFG ACT	LIKELIHOOD OF OCCURRENCE
Birds					
Aythya australis	Hardhead		vu		Moderate
Biziura lobata	Musk Duck		vu		Moderate
Amphibians					
Pseudophryne bibronii	Brown Toadlet		en	L	Moderate[1]
Pseudophryne semimarmorata	Southern Toadlet		vu		Moderate[1]

Source: *(DELWP 2019; DoEE 2018)*

Key: ***Conservation Status in Victoria (Victorian Advisory List)*** *en = Endangered, vu = Vulnerable, nt = near threatened,*
Status under the FFG Act
L = listed as threatened

(1) Species revised down from high after none were recorded during targeted surveys, as they are cryptic species the likelihood is still considered moderate despite the lack of records during targeted surveys.

GROWLING GRASS FROG

Growling Grass Frog is known to occur in lower sections of Merri Creek, around Beveridge and Kalkallo. There are only two records within 5 km of the study area, and none since 1989. Habitat within the study would be considered poor quality for the species with sections of Merri Creek within the study area heavily overgrown with weeds both in the creek and up the banks. The likelihood of occurrence of this species was classified as low and targeted surveys not considered necessary.

STRIPED LEGLESS LIZARD

Likelihood of occurrence of Striped Legless Lizard was considered low due to only patches of derived grassland being mapped. The 1750 EVC modelling (DELWP 2016b) indicates the site would previously have contained vegetation attributable to Swamp Riparian Complex EVC 126. This EVC is not considered to be habitat for the species, which is usually found in what would have been (pre-1750) grassland habitats (DSEWPaC 2011a). The likelihood was considered to be low, there has also only been one record within 5km, in 1991.

4 POTENTIAL ECOLOGICAL IMPACTS

4.1 VEGETATION CLEARING

Native vegetation proposed for retention has been strategically prioritised considering size and connectivity. Retention of an area along the north western boundary of the study area and down Merri Creek has been proposed – as identified in section 3.2.1.4. If this vegetation and all road side vegetation can be retained, then only 3.268 ha of Plains Swampy Woodland and Aquatic Herbland will require removal. Although these are classified as Endangered EVCs, the patches to removed are of poor quality and low scoring (under 25) in habitat hectares.

Native vegetation within the road reserves should be retained through placing any entrances into the precinct in strategic locations where no native vegetation is mapped.

It is understood clearance of patches of remnant native vegetation and scattered trees identified in the field assessment will likely be required for the development of the precinct. Clearance of native vegetation should be limited to areas outside of those identified for strategic retention.

4.2 POTENTIAL IMPACTS ON LISTED SPECIES

No listed flora or fauna species were recorded in the study area. Due to the degraded site condition, no listed flora are still considered likely to occur, however four fauna species are still considered moderately or highly likely to occur.

Southern Toadlet and Brown Toadlet were considered highly likely to occur based the desktop and initial site assessment due to the high number of nearby records, including within the project area itself. Targeted surveys were recommended in the first version of this report. The surveys were undertaken in May during the calling season, however none were recorded. They may still be present in low numbers and not detected during survey. Further surveys are recommended next year during the Autumn survey season. Retaining the riparian vegetation along Merri Creek will protect potential habitat for these species. There are not likely to be any impacts to listed species from the development of this precinct.

4.3 POTENTIAL IMPACTS ON LISTED COMMUNITIES

No EPBC Act listed threatened ecological communities, or FFG Act listed communities were recorded within the study area. The patches of grassy Plains Swampy Woodland mapped do not meet the condition requirements to be considered part of the corresponding EPBC Act or FFG Act listed threatened communities.

5 MITIGATION MEASURES

The following strategies are provided to mitigate ecological impacts at the planning stage and during works.

Prior to the commencement of any development or impacts on the site, adequate briefing and induction of construction crews should occur to ensure that environmental values are given due consideration during construction.

5.1 AVOIDANCE AND MINIMISATION

The retention of all vegetation mapped along the road reserves and rail corridor should be achievable. Any entrances/turn-ins to the precinct should be located where no native vegetation is mapped. A retention zone has been proposed to protect Merri Creek and the surrounding riparian vegetation, mapped as Swampy Riparian Woodland. When determining vegetation to be retained, priority has been made to retain vegetation with the greatest habitat value or that serves as connectivity.

The only vegetation remaining that is likely to require removal is the treeless Plains Swampy Woodland and Aquatic Herbland. Although these are Endangered EVCs, the quality on site is very poor, with low species diversity and native species cover. The long term retention value in such a highly fragmented landscape is low.

Clearing of scattered trees should be avoided where possible with trees incorporated into the precinct landscaping.

5.2 MINIMISING DAMAGE TO TREES

Any works proposed near patches of native vegetation with trees should consider how the impact might affect the critical root zone of tree species by following the *Permitted clearing of native vegetation - Biodiversity assessment handbook* (DELWP 2015). This recommends Tree Protection Zones (TPZs) to prevent indirect losses of native vegetation during construction activities.

To prevent detrimental impacts to trees, the Australian Standard for protection of trees on development sites (AS4970-2009) (Standards Australia 2009) and the Australian Standard for pruning of amenity trees (AS4373-2007) (Standards Australia 2007) should be followed during any development on site. This includes fencing off and protecting any trees to be retaining during construction works.

5.3 VEGETATION RETENTION AND PROTECTION

Following efforts to identify vegetation for retention ‘no go’ zones should be developed. These no go zones should be maintained during development of the precinct. No go zones should be clearly demarcated to avoid any inadvertent or unapproved clearing or damage to areas identified. Vegetation to be retained surrounding the construction areas should be clearly defined on site.

To ensure that any vegetation identified for retention is not damaged or inadvertently removed during development, the following steps should be taken into consideration:

- Install temporary fencing around vegetation that is to be retained (no-go zones).
- Clearly mark TPZ fencing around trees to be retained to ensure they are not damaged during construction as per the Protection of Trees on Development Sites Standard (Standards Australia 2009).

- When fencing the no-go zones, ensure that fencing includes the TPZs of trees to be retained (mapping provided in Appendix C does not include TPZs). The TPZ is defined for standing trees and stags (dead but upright trees) as follows:
  - live trees: an area around the trunk of the tree which has a radius of 12 x the diameter at breast height (to a maximum of 15 metres but no less than 2 metres in diameter) and/or an area sufficient to protect the Structural Root Zone as identified in consultation with an arborist; and
  - dead (stag) trees: an area around the trunk of the tree which has a radius of 15 metres from the base (DELWP 2015).
- Brief contractors regarding the protection of vegetation (including ground cover vegetation) and the purpose and importance of avoidance and minimisation.
- Attach temporary signage identifying areas as environmentally sensitive stating that access and other disturbances are prohibited outside of designated construction zones.
- Select the appropriate type and size of machine so that disturbance and impact to vegetation is minimised and the chances of successful rehabilitation (if applicable) enhanced.
- Adhere to any other construction mitigation requirements outlined by the consultant arborist.

These recommendations should be included in a Construction Environmental Management Plan (CEMP), or the like, developed prior to development.

5.4 SEDIMENT AND EROSION CONTROL

Stripping the land immediately surrounding Merri Creek of understorey vegetation during the development of the precinct can increase risk of sediment laden run off entering the creek. It is recommended to leave an appropriate width buffer surrounding the creek where no clearing works will occur. Clause 42 of the State Environment Protection Policy (SEPP) (Waters) requires construction works be managed to minimise the risks to beneficial uses including risks from dewatering, land disturbance, soil erosion or the discharge of sediments and other pollutants to waters. While vegetation provides the most effective form of erosion control, interim measures may be required throughout the study area. These should be in line with the Victoria EPA Principals of Best Practice Guidelines, such as Environmental Guidelines for Major Construction Sites (Environmental Protection Agency 1996) and Construction Techniques for Sediment Pollution Control (Environmental Protection Agency 1991). These Best Practice Guidelines include, but are not limited to, the following measures:

- limiting machinery and earthworks to construction areas only
- limiting the exposure of disturbed soil to the shortest possible time (e.g. do not clear an area prior to a weekend if rain is forecast)
- diverting water away from exposed soil or loose material
- applying rock armouring on access tracks and roadways to prevent sediment loss
- applying temporary silt trapping techniques
- retaining the natural drainage lines of the sites as much as possible.

These recommendations should be included in a CEMP, developed prior to construction taking place.

5.5 WEED AND DISEASE MANAGEMENT

The type of disturbance associated with construction can result in a window of opportunity for weeds to establish on bare earth. One of the most common forms of introduction is from weed seeds contained within mud on vehicle tyres being deposited into disturbed areas. Without effective weed hygiene, vehicles have the potential to introduce a suite of new weeds that were not present prior to construction.

To ensure weeds and diseases are not brought onto work sites, or existing weeds and diseases (if they occur) are not spread to other sites, the following steps should be taken:

- Prepare a contractor environmental hygiene manual (or follow an existing one) outlining the necessary actions required to prevent weeds and diseases entering and/or leaving the site including:
  - all machinery and vehicles should be free of weed propagules and/or material carrying potential diseases prior to commencement of work
  - if possible, begin work in areas close to native vegetation and move to areas dominated by introduced species and/or ensure machinery is thoroughly cleaned between sites.
- Where possible, avoid working at times of prolific seed set of noxious weeds to avoid their spread by machinery. This is spring time for most of the noxious weeds present on site.

These recommendations should be included in a CEMP prior to development.

Eight CaLP Act listed weeds were located within the study area (see also Section 6.2.6):

- Spear Thistle **Cirsium vulgare*
- Hawthorn **Crataegus monogyna*
- Artichoke Thistle **Cynara cardunculus*
- Flax-leaf Broom **Genista linifolia*
- Chilean Needle-grass **Nassella neesiana*
- Sweet Briar **Rosa rubiginosa*
- Gorse **Ulex europaeus*
- Common Blackberry **Rubus anglocandicans.*

The landowner has legal obligation under the Act to control and minimise the spread of these weeds. It is recommended to undertake weed control measure across the precinct, particularly for the large patches of Gorse along Merri Creek.

5.6 FAUNA MONITORING DURING CONSTRUCTION

Terrestrial fauna is likely to occur within the proposed study area, particularly through areas where there is remnant vegetation such as along Merri Creek. It is recommended that all construction personnel attend a project-specific induction prior to commencing site work. The inductions should include relevant information about the ecological sensitivities of the site and appropriate management measures.

The following guidelines should be followed to minimise harm to fauna during construction:

- Habitat clearing works are to be supervised by a qualified environmental specialist to salvage and relocate any animals disturbed during the works, if required.
- Pits and trenches should be filled in each day if possible to prevent reptiles, mammals and frogs being trapped.
- If left overnight, trenches should be checked in the morning prior to the start of works to identify trapped animals. Trapped animals should be removed before works commence through the placement of a ramp to allow animals to escape themselves.
- Salvaged fauna may need to be relocated, by a suitably qualified ecologist, to sites adjacent to the construction zone or to similar habitat from which they were found.

These recommendations should be included in a CEMP, developed prior to construction works taking place.

6 LEGISLATION AND POLICY

This section addresses any permits, approvals, management plans and offset requirements that may be required for the project under federal, State and local government environmental legislation.

6.1 COMMONWEALTH

6.1.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined in the Act as matters of national environmental significance (MNES). There are nine matters of national environmental significance to which the EPBC Act applies, these are:

- World heritage sites
- National heritage places
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- listed threatened species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

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

No MNES were identified during the site assessments, or considered likely to occur within the study area. A referral is not recommended.

6.2 STATE

6.2.1 ENVIRONMENT EFFECTS ACT 1978

Under Victoria's Environmental Effects Act 1978, projects that could have a 'significant effect' on Victoria's environment can potentially require an Environmental Effect Statement. This Act applies to any public works 'reasonably considered to have or be capable of having a significant effect on the environment'. The Minister for Planning and Environment is the responsible person for assessing whether this Act applies.

Before commencing any public works to which this Act applies, the proponent must initiate an Environmental Effects Statement to be prepared and submit it to the Minister for the Minister's assessment of the environmental effects of the works.

The triggering of an Environmental Effects Statement is dependent on the extent of impact within the study area and whether the impact triggers one or more of the criteria (see Table 6.1). A preliminary assessment based on the ecological aspects has been undertaken in accordance with the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978* (Ministerial Guidelines) (DSE 2006).

In order to undertake this assessment, a simple rating system was used to assess environmental aspects of the project against each EES Referral criterion outlined in the Ministerial Guidelines with commentary included to explain the basis for the assigned rating. The ratings were:

- **Criteria not met** – the project is unlikely to meet this criterion and would not trigger the need to submit a referral under the EES Act.
- **Uncertain** – based on current information it is unclear whether the project would meet the criteria.
- **Criteria met** – the project is likely to meet this criterion and may trigger the need for a referral.

This is based on the current retention layer proposed by WSP in this report. Further avoid and minimisation will occur at the next phase of the project, the NVPP to reduce the impacts.

Table 6.1 Individual potential environmental effects

INDIVIDUAL CRITERIA	WALLAN EAST PRECINCT
Potential clearing of 10 ha or more of native vegetation from an area that: — is of an Ecological Vegetation Class (EVC) identified as endangered; or — is, or is likely to be, of very high conservation significance; and — is not authorised under an approved Forest Management Plan or Fire Protection Plan.	**Criteria not met** Less than 5 ha of native vegetation were mapped within the study area.
Potential long-term loss of a significant proportion (e.g. 1 to 5 per cent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria.	**Criteria not met** No impacts to threatened species likely. Potential habitat for a listed frogs, Brown Toadlet and Southern Toadlet, was found however it would represent less than 1% of available habitat.
Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'.	**Criteria not met** The nearest wetlands are well beyond the study area.
Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term.	**Criteria not met** Mitigation measures to minimise impacts to Merri Creek, no impacts to any estuarine or marine ecosystem.
Potential extensive or major effects on the health, safety or well-being of a human community, due to emissions to air or water or chemical hazards or displacement of residences.	**Uncertain – not assessed** Not assessed as part of a biodiversity assessment.
Potential greenhouse gas emissions exceeding 200,000 tonnes of carbon dioxide equivalent per annum, directly attributable to the operation of the facility.	**Uncertain – not assessed** Not assessed as part of a biodiversity assessment.

The preliminary evaluation of EES criteria for some of the ecological aspects has shown that there no triggers are met and a self-assessment under the Act is not considered to be required.

6.2.2 FLORA AND FAUNA GUARANTEE ACT 1988

The Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) was established to provide a legal framework for enabling and promoting the conservation of all Victoria's native flora and fauna, and to enable management of potentially threatening processes. One of the main features of the Act is the listing process, whereby native species and communities of flora and fauna, and the processes that threaten native flora and fauna, are listed in the schedules of the Act. This assists in identifying those species and communities that require management to survive and identifies the processes that require management to minimise the threat to native flora and fauna species and communities within Victoria.

Under the FFG Act, a permit from DELWP is also required to 'take' (to kill, injure, disturb or collect) listed flora species that are members of protected taxa from public land (this does not apply to private land unless listed species are present, and the land is declared 'critical habitat' for the species). Protected flora are:

- plants that have been declared to be protected under section 46 of the FFG Act
- plants that are listed as threatened under section 10 of the FFG Act
- plants that belong to communities that are listed as threatened under section 10 of the FFG Act.

Two species listed as Protected were recorded in the study area (see Appendix B). A 'permit to take' is required for these species if their removal is required from public land, such as within the road reserves where several *Acacia* species are present. However it is likely that impacts to native vegetation within the road reserves will be avoidable.

No FFG Act listed species or communities were recorded, no permit under this act is required.

6.2.3 GUIDELINES FOR THE REMOVAL, DESTRUCTION OR LOPPING OF NATIVE VEGETATION

The *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017a) (the Guidelines) have been designed to manage the risk to Victoria's biodiversity associated with the removal of native vegetation. The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria under the *Planning and Environment Act 1987.*

6.2.3.1 NATIVE VEGETATION

Native vegetation is defined in planning schemes as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. The Guidelines further classify native vegetation as a patch or a scattered tree:

A patch of native vegetation is:

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

A scattered tree is a native canopy tree that does not form part of a patch.

6.2.3.2 ASSESSMENT PATHWAY

The assessment pathway determines the information that accompanies an application and the decision guidelines that are considered in determining the outcome of an application (DELWP 2017b). The assessment pathway for an application to remove native vegetation reflects its potential impact on biodiversity and is determined from the location and extent of the native vegetation to be removed. The three assessment pathways are:

1. Basic – limited impacts on biodiversity.
2. Intermediate – could impact on large trees, endangered EVCs, and sensitive wetlands and coastal areas.
3. Detailed – could impact on large trees, endangered EVCs, sensitive wetlands and coastal areas, and could significantly impact on habitat for rare or threatened species.

The assessment pathway of an application is determined in accordance with Table 6.2.

Table 6.2 Permit application pathway determination

EXTENT	LOCATION CATEGORY		
	LOCATION 1	LOCATION 2	LOCATION 3
<0.5 hectares and not including any large trees	Basic	Intermediate	Detailed
<0.5 hectares and including one or more large trees	Intermediate	Intermediate	Detailed
≥ 0.5 hectare	Detailed	Detailed	Detailed

Source: Guidelines for the removal, destruction or lopping of native vegetation (DELWP 2017a).

ALL ASSESSMENT PATHWAYS

Application requirements for a permit to remove native vegetation (all assessment pathways) involve the following:

1. Information about the vegetation to be removed including:
   - **a** The assessment pathway and reason for the assessment pathway. This includes the location category of the native vegetation to be removed.
   - **b** A description of the native vegetation to be removed accounted for as per the Guidelines.
   - **c** The offset requirement, determined in accordance with the Guidelines.
2. Topographic and land information relating to the native vegetation to be removed.
3. Recent, dated photographs of the native vegetation to be removed.
4. Details of any other native vegetation approved to be removed, or that was removed without the required approvals within 5 years of the permit application.
5. An avoid and minimise statement.
6. An offset statement providing evidence that an offset that meets the offset requirements for the native vegetation to be removed has been identified and can be secured in accordance with the Guidelines.

DETAILED PATHWAYS APPLICATIONS

This project will likely require a detailed pathway assessment as more the 0.5 ha of native vegetation will require removal. A habitat hectare assessment is required for detailed pathway applications where site assessed site-condition scores are used to account for vegetation losses. Information regarding impacts on rare and threatened species is also required for where impact areas intersect *habitat importance mapping*.

6.2.3.3 VEGETATION CLEARANCE

Habitat hectare assessments were carried out during the site assessments on all native vegetation as per the Guidelines. Assessments were carried out against the most appropriate benchmark for the relevant bioregion. Results of habitat hectare assessments are detailed in Appendix D.

The amounts of each EVC likely to be removed and require offsets based on the current retention zone are provided in Table 6.3 below.

Table 6.3 Vegetation clearance by EVC based on current retention zone

EVC	CONSERVATION SIGNIFICANCE	AMOUNT MAPPED (HA)	REMOVAL (HA)
Aquatic Herbland EVC653	Endangered	0.059	0.059
Plains Swampy Woodland (treeless) EVC651	Endangered	3.346	3.209
Swampy Riparian Woodland EVC83	Endangered	1.077	0
Tall Marsh EVC821	Endangered	0.108	0
Total		**4.59**	**3.268**

6.2.4 PREPARING A NATIVE VEGETATION PRECINCT PLAN

Preparing a Native Vegetation Precinct Plan (DELWP 2017b) provides guidance for the preparation of a Native Vegetation Precinct Plan (NVPP), including when to use an NVPP, the content of an NVPP, and how to implement an NVPP.

An NVPP will be prepared to support development of the site as a part of the overall structure planning process so that decisions relating to native vegetation can inform the planning of other aspects of the precinct. The NVPP will be prepared in consultation with the VPA regarding the proposed precinct design and retention priorities identified in this assessment.

6.2.5 WILDLIFE ACT 1975

The *Wildlife Act 1975* is the primary legislation in Victoria for the protection of wildlife. The Act requires that wildlife research (i.e. fauna salvage and relocation) is regulated through a permit system, which is managed by DELWP.

Authorisation for fauna removal/relocation must be obtained under the *Wildlife Act 1975* through a licence granted by DELWP. Any persons involved in fauna removal, salvage capture or relocation of fauna during mitigation measures must hold a current Management Authorisation under the *Wildlife Act 1975*.

During development, any hollow bearing trees that require removal should be done so with a suitably qualified and authorised fauna handler present to remove and relocate any fauna. This recommendation should be incorporated into a CEMP, developed prior to construction works taking place.

6.2.6 CATCHMENT AND LAND PROTECTION ACT 1994

6.2.6.1 DECLARED NOXIOUS WEEDS

The study area supports eight weed species that are declared noxious under the *Catchment and Land Protection Act 1994* (CaLP Act). Plants occurring on this list are known to, or have the potential to, result in detrimental environmental and/or economic impact.

Under the CaLP Act, declared noxious weeds are categorised into four groups depending on their known and potential impact and specific circumstances for each region. These categories are:

- State Prohibited Weeds (S)
- Regionally Prohibited Weeds (P)
- Regionally Controlled Weeds (C)
- Restricted Weeds (R).

Regionally Controlled weeds are usually widespread, however it is important to prevent further spread. It is the responsibility of the landowner to control these weeds on their property and on adjacent roadside reserves. Restricted Weeds are considered to be a serious threat to primary production, Crown land, the environment and/or community health if they were traded in Victoria.

The field survey identified that study area supports eight regionally controlled (C) and one restricted weed (R). These weeds are listed in Table 6.4. The landholder must take all reasonable measures to prevent their spread and control these weed species both during and after construction.

Table 6.4 Declared noxious weeds occurring within the study area

SCIENTIFIC NAME	COMMON NAME	CALP ACT STATUS
Cirsium vulgare	Spear Thistle	C
Crataegus monogyna	Hawthorn	C
Cynara cardunculus	Artichoke Thistle	C
Genista linifolia	Flax-leaf Broom	C
Nassella neesiana	Chilean Needle-grass	R
Rosa rubiginosa	Sweet Briar	C
Ulex europaeus	Gorse	C
Rubus anglocandicans	Common Blackberry	C

6.3 LOCAL

6.3.1 MITCHELL SHIRE COUNCIL PLANNING SCHEME

The *Planning and Environment Act 1987* provides the legal framework for the operation of Victoria's planning system, commonly referred to as *the Planning Scheme*. Sections of the Mitchell Shire Council Planning Scheme of relevance to ecological matters are discussed below.

6.3.1.1 S52.17 – NATIVE VEGETATION

Section 52.17 of the Mitchell Planning Scheme requires a permit for the clearance of native vegetation as per the Guidelines, and specifically with respect to the three-step approach of avoidance, minimisation and offsetting of native vegetation clearance. See Section 6.2.3 above addressing implications of the Guidelines, and Section 5.1 discussing the avoidance process.

EXEMPTION FOR PLANTED VEGETATION

There are areas of planted Victorian and other Australian native species, such as Spotted Gum *Corymbia maculata*, within the study area, mainly along roadsides. There is an exemption, under Section 52.17 of the Mitchell Shire Planning Scheme for obtaining a planning permit for planted vegetation, unless it was planted using public funding.

The wording of the exemption under Section 52.17 is as follows:

> *Planted vegetation*
>
> *Native vegetation that is to be removed, destroyed or lopped that was either planted or grown as a result of direct seeding. This exemption does not apply to native vegetation planted or managed with public funding for the purpose of land protection or enhancing biodiversity unless the removal, destruction or lopping of the native vegetation is in accordance with written permission of the agency (or its successor) that provided the funding.*

Planted native street trees are generally considered to be for amenity rather than for land protection and biodiversity enhancement. Removal of these trees would not require a permit. Removal of trees planted in gardens on private property also does not require a permit to remove.

7 RECOMMENDATIONS

The following recommendations are made concerning biodiversity values identified across the study area.

- WSP recommend retaining all Swampy Riparian Woodland EVC in the study area through avoiding impacts within the rail corridor and through a retention zone along Merri Creek as identified in the map in Appendix C.
- Further Southern Toadlet and Brown Toadlet surveys are recommended in the Autumn 2021 survey season. Retention areas and legislative advice regarding these species may need to be revised following the additional surveys.
- Designing entrances to the precinct to avoid impacts to roadside native vegetation.
- Weed control and revegetation works along Merri Creek.
- A Construction Environmental Management Plan (CEMP) should be developed to communicate the ecological sensitivities and mitigation measures to the construction crews including sediment and erosion control, weed management, areas to be retained, protecting trees and managing fauna on site.
- All areas of native vegetation to be retained should be fenced off using temporary construction fencing or flagging rope during the precinct development.

8 CONCLUSIONS

WSP undertook ecological field assessments at the Wallan East precinct during November and December 2019 to identify ecological values present on site. Five EVCs were recorded within the project area for a total of 4.59 ha of native vegetation patches and 35 scattered trees. Based on the proposed retention zone, removal of up to 3.268 ha of native vegetation may be required, plus some of the scattered trees, dependant on precinct design.

No MNES were located, no referral under the EPBC Act required. No FFG Act listed flora, fauna or communities were recorded on site. No impacts to FFG Act listed species on public land, no permit under this Act required. No EES criteria were triggered, a self-assessment is not considered to be required.

The next steps:

1. WSP to further workshop retention of native vegetation and habitat across the study area with VPA.
2. Finalise report and development of native vegetation and habitat retention areas following recommended targeted surveys.
3. Develop the NVPP with final native vegetation impacts.

9 LIMITATIONS

This Report is provided by WSP Australia Pty Limited (*WSP*) for Victorian Planning Authority (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal dated 25 February 2019 and agreement with the Client dated 14 October 2019 (*Agreement*).

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APPENDIX A

LIKELIHOOD OF OCCURRENCE ASSESSMENT

A1 LIKELIHOOD OF LISTED FLORA

Table A.1 Likelihood of occurrence of listed flora species across the Wallan South Precinct

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTIONS	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Amphibromus fluitans	River Swamp Wallaby Grass	PMST	VU					Largely confined to permanent swamps, principally along the Murray River between Wodonga and Echuca, uncommon to rare in the south (e.g. Casterton, Moe, Yarram), probably due to historic drainage of wetlands.	Low – Project area is highly modified, there are no previous records within 5 km.	Low
Austrostipa rudis subsp. australis	Veined Spear-grass	VBA			r	1	16/01/1974	Uncommon, mostly in cool areas of southern Victoria. Usually at moderate altitude, in open-forest on sandy or sandstone-derived soils.	Low – Project area is highly modified, there is a lack of recent and abundant records.	Low
Coronidium gunnianum	Pale Swamp Everlasting	VBA			vu	25	20/06/2014	Widespread throughout the state except for the north-west and the alpine and adjacent mountainous areas. Usually occurs at low elevations (under c. 100 m) where mostly in grasslands and riverine *Eucalyptus camaldulensis* woodland on soils that are prone to inundation.	Low – This species can persist in wetter depressions of grazed agricultural land, however this species is relatively non-cryptic and observable throughout the year and was not observed during surveys.	Low
Cullen parvum	Small Scurf-pea	VBA		L	en	1	13/12/2000	In Victoria species is known from a few localities in north-central and south-central areas, and western suburbs of Melbourne, where it grows mainly in grassland or grassy woodland environments, often on basalt-derived soils.	Low – Project area is highly modified, there is a lack of recent and abundant records. Not observed.	Low
Dianella amoena	Matted Flax-lily	VBA PMST	EN	L	en	18	10/10/2017	Occurs mainly in lowland grasslands, grassy woodlands, valley grassy forest and creeklines of herb-rich woodland.	Low – project area highly modified, not detected during site assessments.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTIONS	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Dodonaea procumbens	Trailing Hop-bush	PMST	VU		vu			Largely confined in Victoria to the south-west with outlying occurrences near Castlemaine, Avoca, Skipton, Camperdown. Grows in low-lying, often winter-wet areas in woodland, low open-forest and grasslands on sands and clays.	Low – Project area is highly modified, there are no previous records within 5 km.	Low
Glycine latrobeana	Clover Glycine	PMST						Widespread but of sporadic occurrence and rarely encountered. Grows mainly in grasslands and grassy woodlands.	Low – Project area is highly modified, there are no previous records within 5 km.	Low
Lachnagrostis adamsonii	Adamson's Blown-grass	PMST	EN	L	vu			Occurs in and around saline depressions on the Volcanic Plain where recorded from Portarlington west almost to the South Australian border.	Low – Project area is located outside of the species known distribution. No suitable habitat for this species.	Low
Lepidium hyssopifolium s.s.	Basalt Peppercress	VBA	EN	L	en	1	14/10/2010	In Victoria the species occurs mostly west of Melbourne within the Victorian Midlands and Victorian Volcanic Plain Bioregions. Previously it was known to occur in Eucalypt woodlands and open casuarina woodlands with grassy ground cover but recent records are from highly modified and heavily disturbed environments with open, bare ground such as road and rail verges.	Low – single record within 5 km but outside primary range of this species.	Low
Leucochrysum albicans var. tricolor	Hoary Sunray	PMST	EN	L	en			Very rare in Victoria, the only recent collections from roadside verges near Wickliffe, Willaura, Streatham, Inverleigh and Creswick. All other collections were gathered last century, from Mt Cole, the Grampians and the Port Fairy district.	Low – Project area is located outside of the species current known distribution and there are no previous records within 5 km.	Low
Microseris scapigera s.s.	Plains Yam-daisy	VBA			vu	44	11/05/2015	Formerly widespread in moist depressions on the basalt plains of western Victoria, but now very rare due to loss of habitat.	Low – unlikely to be found on such a disturbed site.	Low
Pimelea spinescens subsp. spinescens	Spiny Rice-flower	PMST	CR	L	en			Grows in grassland, open shrubland and occasionally woodland, often on basalt-derived soils. Mostly west of Melbourne (to near Horsham), but extending as far north as Echuca.	Low – Project area is highly modified, there are no previous records within 5 km.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTIONS	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Pomaderris vacciniifolia	Round-leaf Pomaderris	PMST	CR	L	en			Largely confined to Damp Forest, Herb-rich Foothill Forest EVC's north-east of Melbourne in the upper catchment of the Yarra, Plenty and Yea Rivers in an area bounded by Healesville, Marysville and Whittlesea. Also occurs in the Tyers-Walhalla areas.	Low – Project area is highly modified and lacks the suitable habitat features required to support this species. Furthermore, there are no previous records within 5 km.	Low
Prasophyllum frenchii	Maroon Leek-orchid	PMST	EN	L	en			Widespread across southern Victoria, but rare. Occurs in grassland, heathland and open forest on well-drained or water-retentive sand or clay loams.	Low – Project area is highly modified and lacks the suitable habitat features required to support this species. Furthermore, there are no previous records within 5 km.	Low
Pterostylis chlorogramma	Green-striped Greenhood	PMST	VU	L	vu			Apparently localized in Victoria, but exact range uncertain due to confusion with closely allied species. Grows in moist areas of heathy and shrubby forest, on well-drained soils.	Low – Project area is highly modified and lacks the suitable habitat features required to support this species. Furthermore, there are no previous records within 5 km.	Low
Rutidosis leptorhynchoides	Button Wrinklewort	PMST	EN	L	en			In Victoria confined to basaltic grasslands between Rokewood and Melbourne where endangered due to loss of habitat (formerly occurring as far west as Casterton, and on the Gippsland Plain near Newry).	Low – Project area is highly modified, there are no previous records within 5 km.	Low
Rytidosperma monticola	Small-flower Wallaby-grass	VBA			r	1	5/12/2005	Mostly in dryish grassy woodland, chiefly through central and north-eastern Victoria (e.g. Ararat, Warby Range), but with isolated occurrences in the far east (e.g. Mt Delegate, upper Genoa R), but rather rare in Victoria.	Low – Project area is highly modified. There is also a lack of abundant records. Not detected during site assessments.	Low
Senecio campylocarpus	Floodplain Fireweed	VBA			r	1	6/06/1993	Occurs throughout central Victoria and in the north east where it is found in forests and woodland, usually in seasonally inundated areas, on loam to clay soils.	Low – There is a lack of abundant and recent records. Not observed.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTIONS	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Senecio psilocarpus	Swamp Fireweed	VBA PMST	VU		vu	21	30/10/2002	In Victoria, the species is restricted to the south of the state. It grows in high quality herb rich wetlands where tree canopy is mostly absent on volcanic clays and peaty soils.	Low – Project area is highly modified and lacks the suitable habitat features required to support this species.	Low
Thelymitra matthewsii	Spiral Sun-orchid	PMST	VU	L	vu			Widely distributed but rare, in coastal sandy flats or slightly elevated sites (to 400 m) in well-drained soils (sandy loams to gravelly limestone soils) in open forest. Plants colonise disturbed sites and slowly disappear as these sites stabilise.	Low – Project area is located outside of the species current known distribution and there are no previous records within 5 km.	Low
Xerochrysum palustre	Swamp Everlasting	VBA PMST	VU	L	vu	70	20/06/2014	Occurs in lowland swamps, usually on black cracking clay soils, scattered from near the South Australian border north-west of Portland to Bairnsdale district, but rare due to habitat depletion.	Low – whilst there are many records within 5 km, the study area lacks suitable wetlands likely to support this species. Not observed.	Low

Key to the table - Conservation status

- ***Conservation Status in Australia (Environment Protection and Biodiversity Conservation Act 1999)***
  CR = Critically Endangered, EN = Endangered, VU = Vulnerable
- **Conservation Status in Victoria (Flora and Fauna Guarantee Act 1988)**
  L = Listed as threatened
- ***Conservation Status in Victoria (Victorian Advisory List)***
  x = presumed extinct, e = Endangered in Victoria, v = Vulnerable in Victoria, r = Rare in Victoria, k = Poorly Known in Victoria, p = All infraspecific taxa included in Advisory List, # = native but some strands may be alien

A2 LIKELIHOOD OF LISTED FAUNA

Table A.2 Likelihood of occurrence of listed fauna species across the Wallan South Precinct

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Birds										
Actitis hypoleucos	Common Sandpiper	VBA PMST	M		vu	3	2/11/2018	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	Low – Project area lacks suitable habitat features required to support this species.	Low
Anthochaera Phrygia	Regent Honeyeater	PMST	CR	L	cr			Occurs mostly in box-ironbark forests and woodland and prefers wet, fertile sites such as along creek flats, broad river valleys and foothills. Riparian forests with *Casuarina cunninghamiana* and *Amyema cambagei* are important for feeding and breeding.	Low – Project area lacks suitable habitat features required to support this species.	Low
Apus pacificus	Fork-tailed Swift	PMST	M					It is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground. It mostly occurs over inland plains but sometimes above foothills or in coastal areas over cliffs, beaches, islands and well out to sea. It also occurs over towns and cities.	Low – no nearby records	Low
Ardea alba	Great Egret	VBA		L	vu	1	14/11/1989	Prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands.	Low – Project area is highly modified and there is a lack of recent and abundant records.	Low
Ardea intermedia plumifera	Plumed Egret	VBA		L	en	3	11/12/2018	Habitat preferences for this species include freshwater swamps, billabongs, floodplains and wet grasslands with dense aquatic vegetation. The species is only occasionally seen in estuarine or intertidal habitats.	Low – Project area lacks suitable habitat features required to support this species.	Low
Aythya australis	Hardhead	VBA			vu	52	22/07/2019	On terrestrial wetlands and occasionally sheltered estuarine and inshore waters. Almost entirely aquatic, preferring large deep fresh waters with abundant aquatic vegetation; particularly deep swamps, lakes, creeks, billabongs and alluvial plains.	Low – Project area lacks suitable habitat features required to support this species.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Biziura lobata	Musk Duck	VBA			vu	25	7/01/2019	Widespread in Southeast and Southwest parts of continent, on terrestrial wetlands, estuarine habitats and sheltered inshore waters. Almost entirely aquatic; preferring deep water of large permanent swamps, lakes and estuaries, where conditions stable and aquatic flora abundant.	Low – Project area lacks suitable habitat features required to support this species.	Low
Botaurus poiciloptilus	Australasian Bittern	VBA PMST	EN	L	en	1	22/02/1990	Occurs in shallow, vegetated freshwater or brackish swamps. Requires permanent wetlands with tall dense vegetation, particularly bulrushes and spike rushes. Whilst it can be found feeding in more open areas, the species relies on dense vegetation cover to breed and roost.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of recent and abundant records.	Low
Calidris acuminata	Sharp-tailed Sandpiper	PMST	M					Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland.	Low – Project area lacks suitable habitat features required to support this species.	Low
Calidris ferruginea	Curlew Sandpiper	PMST	CR, M	L	en			Occurs in inter-tidal mudflats of estuaries, lagoons, mangrove channels and also around lakes, dams, floodwaters and flooded saltbush surrounding inland lakes.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Calidris melanotos	Pectoral Sandpiper	PMST	M		nt			Prefers shallow fresh to saline wetlands including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Chlidonias hybrida	Whiskered Tern	VBA			nt	5	11/10/2018	Prefer shallow terrestrial freshwater wetlands, either permanent or ephemeral, including lakes swamps, billabongs, river pools, reservoirs, large dams, sewage ponds, flooded saltmarsh and farmland, often around floodwaters. Usually in wetlands with much submerged and emergent vegetation, such as grass, sedges, reeds and rushes, occasionally also in swamps of lignum, bluebush, canegrass or saltmarsh.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Cinclosoma punctatum	Spotted Quail-thrush	VBA			nt	1	18/12/1991	Subtropical, tropical and temperate dry forests. Range extends from South east Queensland along the south east coast and through most of Southern and Eastern Victoria.	Low – Project area is highly modified and there is a lack of recent and abundant records.	Low
Circus assimilis	Spotted Harrier	VBA			nt	2	4/03/1999	Found in open grasslands, woodland including mallee country, inland riparian woodland and shrubland particularly in arid and semi-arid areas.	Low – Project area is highly modified and there is a lack of recent and abundant records.	Low
Falco subniger	Black Falcon	VBA		L	vu	1	22/02/1990	Found in the arid and semi arid zones. It is usually found near watercourses or utilizing patches of isolated trees. It hunts over open wooded grasslands, saltbush plains, bluebush plains and other low vegetation.	Low – Project area is highly modified and there is a lack of recent and abundant records.	Low
Gallinago hardwickii	Latham's Snipe	VBA PMST	M		nt	8	1/12/2018	Occurs in freshwater or brackish wetlands generally near protective vegetation cover.	Low – Project area lacks suitable habitat features required to support this species.	Low
Grantiella picta	Painted Honeyeater	PMST	VU	L	vu			Lives in dry forests and woodlands. Primary food is the mistletoes in the genus *Amyema*, though it will take some nectar and insects. Its breeding distribution is dictated by presence of mistletoes which are largely restricted to older trees.	Low – Project area lacks suitable habitat features required to support this species and there have been no records within 5 km.	Low
Hirundapus caudacutus	White-throated Needletail	VBA PMST	VU, M	L	vu	1	2/03/2018	Occurs in airspace over forests, woodlands, farmlands, plains, lakes, coasts and towns.	Low – Species is unlikely to utilise habitat within the project area and there is a lack of abundant records.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Lathamus discolor	Swift Parrot	VBA PMST	CR	L	en	1	23/05/1991	In mainland Australia is semi-nomadic, foraging in flowering eucalypts in eucalypt associations, particularly box-ironbark forests and woodlands. Preference for sites with highly fertile soils where large trees have high nectar production, including along drainage lines and isolated rural or urban remnants, and for sites with flowering Acacia pycnantha.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of abundant and recent records.	Low
Monarcha melanopsis	Black-faced Monarch	PMST	M					Mainly occurs in rainforest ecosystems, and sometimes in nearby open eucalypt forest with a dense, shrubby understorey. In Victoria mainly found in East Gippsland, it is a vagrant in the west.	Low – Project area is located outside of the species known distribution. Any occurrences are vagrants.	Low
Motacilla flava	Yellow Wagtail	PMST	M					This species occurs in a range of habitats including estuarine habitats such as sand dunes, mangrove forests and coastal saltmarshes. This species also occurs in open grassy areas including disturbed sites such as sports grounds and has been recorded on the edges of wetlands, swamps, lakes and farm dams.	Low – No nearby records	Low
Myiagra cyanoleuca	Satin Flycatcher	PMST	M					Occurs in heavily vegetated gullies, in forests and taller woodlands. During migration it is found in coastal forests, woodlands, mangroves, trees in open country and gardens.	Low – Project area lacks suitable habitat features required to support this species.	Low
Ninox connivens	Barking Owl	VBA		L	en	1	16/02/1990	Found in open woodlands and the edges of forests, often adjacent to farmland. They are less likely to use the interior of forested habitat. They are usually found in habitats that are dominated by Eucalyptus species, particularly red gum, and, in the tropics, paperbark species. They prefer woodlands and forests with a high density of large trees and particularly sites with hollows that are used by the owls as well as their prey.	Low – Project area is highly modified and there is a lack of recent and abundant records.	Low
Numenius madagascariensis	Eastern Curlew	PMST	CR, M	L	vu			Primarily coastal in distribution, commonly associated with sheltered coasts, estuaries, harbours and lagoons. Breeds in the northern hemisphere, returning to Australia for the non-breeding season.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Oxyura australis	Blue-billed Duck	VBA		L	en	19	7/01/2019	Found on temperate, fresh to saline, terrestrial wetlands, and occupies artificial wetlands. Prefers deep permanent open water, within or near dense vegetation. Nest in rushes, sedge, Lignum and paperbark Melaleuca.	Low – Project area lacks suitable habitat features required to support this species.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Pandion haliaetus	Osprey	PMST	M					Tolerates a wide variety of habitats, nesting in any location near a body of water providing an adequate food supply.	Low – No suitable habitat in study area to support this species.	Low
Pedionomus torquatus	Plains-wanderer	VBA PMST	CR	L	cr	1	1/04/1905	Sparse grasslands that have 50% bare ground, widely spaced plants up to 10 cm high and remaining standing vegetation less than 5 centimetres in height. Occasionally uses cereal stubble but cannot persist in agricultural landscape. Suitable habitat tends to be restricted to small (50–300 ha) patches that do not support dense pasture growth under any seasonal conditions.	Low – Project area is highly modified and there is a lack of recent and abundant records.	Low
Platalea regia	Royal Spoonbill	VBA			nt	2	22/02/1990	Found in terrestrial wetlands, sheltered marine habitats and wet grasslands; permanent and ephemeral waters used where available in arid interior. Feeds in shallow waters (less than 0.4 m) over substrate of sand, mud or clay.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of recent and abundant records.	Low
Pyrrholaemus sagittatus	Speckled Warbler	VBA		L	vu	1	31/05/1991	Occurs in a wide range of eucalypt dominated vegetation with a grassy understorey and is often found on rocky ridges or in gullies.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of recent and abundant records.	Low
Rhipidura rufifrons	Rufous Fantail	PMST	M					Occurs in a range of habitats including the undergrowth of rainforests/wetter eucalypt forests/gullies, monsoon forests paperbarks, sub-inland and coastal scrubs, mangroves, watercourses, parks and gardens.	Low – Project area lacks suitable habitat features required to support this species.	Low
Rostratula australis	Australian Painted Snipe	PMST	EN	L	cr			Inhabits shallow, vegetated, temporary or infrequently filled wetlands, including where there are trees such as River Red Gum, Poplar Box or shrubs such as Lignum or Samphire.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Spatula rhynchotis	Australasian Shoveler	VBA			vu	30	22/07/2019	Uses a wide variety of wetlands; prefers large permanent lakes or swamps that have abundant cover.	Low – Project area lacks suitable habitat features required to support this species.	Low
Stictonetta naevosa	Freckled Duck	VBA		L	en	1	26/02/2017	In most years this species appear to be nomadic between ephemeral inland wetlands. In dry years they congregate on permanent wetlands while in wet years they breed prolifically and disperse widely, generally towards the coast.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of abundant records.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Mammals										
Dasyurus maculatus maculatus	Spotted-tail Quoll	PMST	EN	L	en			Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Isoodon obesulus obesulus	Southern Brown Bandicoot	VBA	EN	L	nt	1	10/02/1968	Inhabit a variety of habitats including heathland, shrubland, sedgeland, heathy open forest and woodland and are usually associated with infertile, sandy and well drained soils, but can be found in a range of soil types. Within these vegetation communities they typically inhabit areas of dense ground cover.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of recent and abundant records.	Low
Mastacomys fuscus mordicus	Broad-toothed Rat	PMST	VU	L	en			Species has a highly fragmented distribution across Victoria, ACT and NSW. In Victoria, the species primarily occurs at higher elevations in areas with cooler climates and high annual rainfall that provide a plentiful food supply and adequate vegetation cover.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Petauroides volans	Greater Glider	PMST	VU	L	vu			The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Phascogale tapoatafa	Brush-tailed Phascogale	VBA		L	vu	1	14/06/1962	Largely arboreal it occurs in a range of habitats which have reliable rainfall (500–2000 mm), but has preference for open dry sclerophyll forest on ridges (up to 600 m alt) with little/sparse ground cover.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of recent and abundant records.	Low
Potorous tridactylus tridactylus	Long-nosed Potoroo	PMST	VU	L	nt			Occurs in a range of habitats: coastal forest and woodland with a moderately dense heathy understorey, dense coastal scrubs or heath, wet and dry sclerophyll forest and sub-tropical, warm temperate and cool temperate rainforest of the eastern slopes and highlands. Often associated with gullies and forest ecotones.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Pseudomys fumeus	Smoky Mouse	PMST	EN	L	en			The Smoky Mouse occurs in a variety of vegetation communities, ranging from coastal heath to dry ridgeline forest, sub-alpine heath and, occasionally, wetter gullies (Menkhorst, 1981). Except for the wetter sites, a consistent feature of Smoky Mouse habitats is the diversity of heath and bush-pea species present, combined with potential shelter sites in the form of woody debris or rocks.	Low – Project area lacks suitable habitat features required to support this species and there are no previous records within 5 km.	Low
Pteropus poliocephalus	Grey-headed Flying-fox	PMST	VU	L	vu			Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops also provide habitat for this species.	Low – No previous records within 5 km.	Low
Rhinolophus megaphyllus megaphyllus	Eastern Horseshoe Bat	VBA		L	vu	1	28/03/1988	This species can be found in a variety of environments including temperate and tropical rainforests, deciduous forest, sclerophyll forest, woodlands, coastal scrub, and grasslands. They roost in warm, humid caves, rock outcrops, old mines and tunnels and non-occupied buildings.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of abundant and recent records.	Low
Sminthopsis crassicaudata	Fat-tailed Dunnart	VBA			nt	1	24/11/1991	In a variety of open vegetation habitats including open woodland, low shrublands of saltbush and bluebush, tussock grasslands on clay or sandy soils, glibber plain and, in southern parts of its range, farmlands.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of abundant and recent records.	Low
Reptiles										
Delma impar	Striped Legless Lizard	VBA PMST	VU	L	en	1	28/05/1991	Inhabit both native and exotic dominant grasslands including secondary/derived grasslands.	Low – Soil structure is likely highly modified due to agricultural practices and there is a lack of abundant and recent records. Study area is not derived from Plains Grassland or Grassy Woodland habitat.	Low
Pseudemoia pagenstecheri	Tussock Skink	VBA			vu	1	18/10/1988	Found in the Grampians in the west through the basalt plains west of Melbourne to the North-east Victoria. Among medium to long grass tussocks in open grasslands where trees are absent or sparse.	Low – Project area lacks suitable habitat features required to support this species and there is a lack of abundant and recent records.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Amphibians										
Litoria raniformis	Growling Grass Frog	VBA PMST	VU	L	en	2	14/11/1989	Usually found amongst emergent vegetation such as *Typha*, *Phragmites* and *Eleocharis* within or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds, and farm dams. It also occurs in irrigation channels and crops, lignum shrublands, black box and river red gum woodlands and at the periphery of rivers.	Low – this part of Merri Creek is unlikely to provide suitable habitat to support this species and there is a lack of abundant and recent records.	Low
Pseudophryne bibronii	Brown Toadlet	VBA		L	en	150	24/11/1991	Usually found singly under rocks and logs on slopes in grasslands or beside ditches. Found both in wet and dry sclerophyll forest. Breeding congregations usually occur in inundated grassy areas beside gutters, small creeks etc.	High – records exist from dams within the study area.	Low
Pseudophryne semimarmorata	Southern Toadlet	VBA			vu	91	28/03/1988	It occurs mainly to the north, east and south-east of Melbourne. It is found in forested areas, where it hides under fallen timber, rocks, etc.	High – records exist from dams within the study area.	Low
Fish										
Galaxias rostratus	Flathead Galaxias	PMST	CR	X	vu			Only known in the Southern half of the Murray-Darling Basin system. Inhabits a variety of habitats including billabongs, lakes, swamps, and rivers with a preference for still or slow flowing waters.	Low – Merri Creek is unlikely to provide suitable habitat to support this species and there are no previous records within 5 km.	Low
Galaxiella pusilla	Dwarf Galaxis	PMST	VU	L	en			Occurs in slow flowing and still, shallow, permanent and temporary freshwater habitats such as swamps, drains and the backwaters of streams and creeks, often (but not always) containing dense aquatic macrophytes and emergent plants.	Low – Merri Creek is unlikely to provide suitable habitat to support this species and there are no previous records within 5 km.	Low
Maccullochella peelii	Murray Cod	VBA	VU	L	vu	1	1/01/1970	Occurs in lower reaches of the Murray-Darling Basin, where the water temperature is warm. The diverse range of habitats frequented by the Murray Cod includes slow moving rivers, murky billabongs and clear, rocky rivers.	Low – Merri Creek is unlikely to provide suitable habitat to support this species and there is a lack of abundant and recent records.	Low
Macquaria australasica	Macquarie Perch	PMST	EN	L	en			Small discreet populations remain in the Murray Darling Catchment in Northern Victoria with a larger translocated population occurring in the Yarra River near Warrandyte.	Low – Merri Creek is unlikely to provide suitable habitat to support this species and there are no previous records within 5 km.	Low

SCIENTIFIC NAME	COMMON NAME	SOURCE	EPBC ACT	FFG ACT	VIC ADV LIST	COUNT OF SIGHTINGS	LAST RECORD	HABITAT DESCRIPTION	LIKELIHOOD OF OCCURRENCE	LIKELIHOOD OF IMPACT
Prototroctes maraena	Australian Grayling	PMST	VU	L	vu			It is a mid-water, freshwater species that occurs most commonly in clear, gravelly streams with a moderate flow. Prefers deep, slow flowing pools.	Low – Merri Creek is unlikely to provide suitable habitat to support this species and there are no previous records within 5 km.	Low
Insects										
Synemon plana	Golden Sun Moth	VBA PMST	CR	L	cr	11	4/01/2017	This species occurs where wallaby grasses *Austrodanthonia spp.* dominate the understory, such as grassy Box-Gum Woodlands or Natural Temperate Grasslands, as larvae feed exclusively on the roots of wallaby grass. Bare ground separating low tussocks of wallaby grass are key microhabitat features for the Golden Sun Moth, as courting behaviour occurs here.	Low – surveys conducted in patches of suitable habitat but none located.	Low

Key to the table – Conservation status

- **Conservation Status in Australia (Environment Protection and Biodiversity Conservation Act 1999)**
  CR = Critically Endangered, EN = Endangered, VU = Vulnerable, M = Migratory
- **Conservation Status in Victoria (Flora and Fauna Guarantee Act 1988)**
  L = listed as threatened, N = Nominated for listing as threatened
- **Conservation Status in Victoria (Victorian Advisory List)**
  cr = Critically Endangered, en = Endangered, vu = Vulnerable, nt = near threatened, dd = Data Deficient

APPENDIX B

FLORA AND FAUNA OBSERVED ON SITE

B1 FLORA

Table B.1 Flora species observed on site

SCIENTIFIC NAME	COMMON NAME	VIC ADV LIST	STATUS	CALP ACT	FFG ACT
Acacia mearnsii	Black Wattle				P
Acacia melanoxylon	Blackwood				
Agrostis capillaris	Brown-top Bent		*		
Amphibromus nervosus	Common Swamp Wallaby-grass				
Anthosachne scabra s.l.	Common Wheat-grass				
Anthoxanthum odoratum	Sweet Vernal-grass		*		
Arctotheca calendula	Cape weed		*		
Avena spp.	Oat		*		
Briza maxima	Large Quaking-grass		*		
Briza minor	Lesser Quaking-grass		*		
Bromus catharticus	Prairie Grass		*		
Bromus diandrus	Great Brome		*		
Bromus hordeaceus	Soft Brome		*		
Calocephalus lacteus	Milky Beauty-heads				P
Cassinia arcuata	Desert Cassinia				
Cirsium vulgare	Spear Thistle		*	C	
Corymbia maculata	Spotted Gum	Vu	# planted		
Cotula coronopifolia	Water Buttons		*		
Crataegus monogyna	Hawthorn		*	C	
Cynara cardunculus	Artichoke Thistle		*	C	
Cynosurus echinatus	Rough Dog's-tail		*		
Dactylis glomerata	Cocksfoot		*		
Ehrharta erecta	Panic Veldt-grass		*		
Ehrharta longiflora	Annual Veldt-grass		*		
Eleocharis acuta	Common Spike-sedge				
Eucalyptus camaldulensis	River Red Gum				
Eucalyptus leucoxylon	Yellow Gum				
Eucalytpus ovata	Swamp Gum				
Eucalyptus polyanthemos	Red Box				

SCIENTIFIC NAME	COMMON NAME	VIC ADV LIST	STATUS	CALP ACT	FFG ACT
Eucalyptus radiata	Narrow-leaf Peppermint				
Eucalyptus viminalis subsp viminalis	Manna Gum				
Festuca arundinacea	Tall Fescue		*		
Fraxinus angustifolia	Desert Ash		*		
Fumaria capreolata	White Fumitory		*		
Galenia pubescens var. pubescens	Galenia		*		
Galium aparine	Cleavers		*		
Genista linifolia	Flax-leaf Broom		*	C	
Holcus lanatus	Yorkshire Fog		*		
Hordeum leporinum	Barley-grass		*		
Hordeum vulgare s.l.	Barley		*		
Hypericum perforatum subsp. veronense	St John's Wort		*		
Hypochaeris radicata	Flatweed		*		
Juncus amabilis	Hollow Rush				
Juncus australis	Austral Rush				
Juncus flavidus	Gold Rush				
Juncus pallidus	Pale Rush				
Lachnagrostis filiformis s.l.	Common Blown-grass				
Lolium perenne	Perennial Rye-grass		*		
Melaleuca armillaris subsp. armillaris	Giant Honey-myrtle	r	# planted		
Microlaena stipoides var. stipoides	Weeping Grass				
Nassella neesiana	Chilean Needle-grass		*	R	
Olea europaea	Olive		*		
Paspalum distichum	Water Couch		*		
Phalaris aquatica	Toowoomba Canary-grass		*		
Phragmites australis	Common Reed				
Plantago coronopus	Buck's-horn Plantain		*		
Plantago lanceolata	Ribwort		*		

SCIENTIFIC NAME	COMMON NAME	VIC ADV LIST	STATUS	CALP ACT	FFG ACT
Poa labillardierei	Common Tussock-grass				
Poa labillardierei	Tussock-grass				
Populus alba	White Poplar		*		
Potamogeton ochreatus	Blunt Pondweed				
Romulea rosea	Onion Grass		*		
Rosa rubiginosa	Sweet Briar		*	C	
Rubus anglocandicans	Common Blackberry		*	C	
Rumex crispus	Curled Dock		*		
Rytidosperma caespitosum	Ringed Wallaby-grass				
Rytidosperma duttonianum	Brown-baked Wallaby-grass				
Rytidosperma erianthum	Hill Wallaby-grass				
Rytidosperma racemosum var. racemosum	Slender Wallaby-grass				
Rytidosperma setaceum	Bristly Wallaby-grass				
Themeda triandra	Kangaroo Grass				
Ulex europaeus	Gorse		*	C	
Veronica gracilis	Slender Speedwell				
Vulpia bromoides	Squirrel-tail Fescue		*		

* – introduced species

– non-indigenous native

C – Regionally Controlled Weed

R – Restricted Weed

P – Protected under the FFG Act

B2 FAUNA

Table B.2 Fauna species observed onsite

COMMON NAME	SCIENTIFIC NAME	LISTING	ORIGIN
Australian Magpie	*Gymnorhina tibicen*		
Australian Wood Duck	*Chenonetta jubata*		
Common Froglet	*Crinia signifera*		
Common Myna	*Acridotheres tristis*		*
Common Starling	*Sturnus vulgaris*		*
Crimson Rosella	*Platycercus elegans*		
Eastern Blue-tongue Lizard	*Tiliqua scincoides*		
Eastern Grey Kangaroo	*Macropus giganteus*		
Eurasian Coot	*Fulica atra*		
European Brown Hare	*Lepus europaeus*		*
European Rabbit	*Oryctolagus cuniculus*		*
Galah	*Eolophus roseicapilla*		
Grey Fantail	*Rhipidura albiscapa*		
Little Raven	*Corvus mellori*		
Pacific Black Duck	*Anas superciliosa*		
Peregrine Falcon	*Falco peregrinus*		
Red Fox	*Vulpes vulpes*		*
Sulphur-crested Cockatoo	*Cacatua galerita*		
Superb Fairy-wren	*Malurus cyaneus*		
Welcome Swallow	*Hirundo neoxena*		

*- introduced species

CR – Critically Endangered under the EPBC Act

cr – Critically Endangered under the Victorian Advisory Lists

L – Listed under the Flora and Fauna Act

APPENDIX C

MAPPING

APPENDIX C-1
LOCALITY MAP

BYLANDS
WANDONG
HEATHCOTE JUNCTION
YABAMAC
DARRAWEIT ROAD
WITTAGONG CREEK
MERRI CREEK
HUME FREEWAY
WALLAN
WALLAN CREEK
WALLAN STATION
WALLAN EAST
UPPER PLENTY
STRATHAIRD CREEK
NORTHERN HIGHWAY
TAYLORS CREEK
EPPING-KILMORE ROAD
OLD SYDNEY ROAD
KALKALLO CREEK
BEVERIDGE
MERRIANG
GLENVALE

Wallan East PSP Biodiversity Assessment

Figure 1
Site location - Wallan East

Legend

- Project Boundary
- Train station
- Railway

0 1,000 2,000 Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:60,000 Date: 17/06/20

Data sources: - DELWP, Geoscience Australia
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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APPENDIX C-2
EVC MAP

wsp

Wallan East PSP
Biodiversity Assessment

Figure 2
Modelled EVCs and VBA Records

Legend

- Project Boundary
- VBA threatened flora
- VBA threatened fauna
- Train station
- Railway
- Watercourse
- Cadastral Boundary

Ecological Vegetation Classes - Extant (2005) modelling

- Grassy Dry Forest
- Grassy Woodland
- Herb-rich Foothill Forest
- Herb-rich Foothill Forest/Shrubby Foothill Forest Complex
- Riparian Forest
- Riparian Scrub/Swampy Riparian Woodland Complex
- Swampy Riparian Complex
- Valley Grassy Forest

0 100 200 Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:5,500 Date: 8/19/2020

APPENDIX C-3
ECOLOGICAL VALUES

wsp

Wallan East PSP
Biodiversity Assessment

Figure 3
Wallan East Ecological Values

HUME FREEWAY

WALLAN-WHITTLESEA ROAD

EPPING-KILMORE ROAD

Legend

- Scattered Trees
- Watercourse
- Cadastral Boundary
- Revegetation

Ecological Vegetation Class

- Aquatic Herbland
- Plains Swampy Woodland (treeless)
- Swampy Riparian Woodland
- Tall Marsh

0 80 160 240 320 400 Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:7,500 Date: 8/19/2020

APPENDIX C-4
TOADLET SURVEYS

Wallan East PSP
Biodiversity Assessment

Figure 4
Brown Toadlet and Southern Toadlet Targeted Surveys

Legend

- Railway
- Waterways
- Cadastre
- Project Boundary

0 150 300
Metres

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

1:7,500 Date: 8/20/2020

Data sources: - DELWP, Geoscience Australia
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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APPENDIX D

HABITAT HECTARE SCORES

Table D.1 Habitat hectare scores

PATCH NUMBER	EVC	LARGE TREE	TREE CANOPY	WEEDS	UNDERSTORY	RECRUITMENT	TREELESS RECRUITTMENT	LITTER	LOGS	HABITAT	LNSCP CNXT	HH SCORE	HABITAT HECTARES	RETENTION
9	Aquatic Herbland	0	0	2	5	NA	6	2	0	15	2	0.17	0.059	Remove
4	Plains Swampy Woodland	0	0	0	5	0	NA	2	0	7	2	0.09	0.005	Remove
11	Plains Swampy Woodland	0	0	0	5	0	NA	2	0	7	2	0.09	0.059	Remove
1	Plains Swampy Woodland	0	0	2	5	0	NA	2	0	9	2	0.11	0.006	Remove
2	Plains Swampy Woodland	0	0	2	5	0	NA	2	0	9	2	0.11	0.010	Remove
3	Plains Swampy Woodland	0	0	2	5	0	NA	2	0	9	2	0.11	0.011	Remove
13	Plains Swampy Woodland	0	0	2	5	0	NA	2	0	9	2	0.11	0.009	Remove
18	Plains Swampy Woodland	0	0	7	5	0	NA	4	0	16	2	0.18	0.024	Remove
39	Plains Swampy Woodland	0	0	2	5	0	NA	2	0	9	2	0.11	0.015	Retain
26	Plains Swampy Woodland	0	0	0	5	0	NA	2	0	7	2	0.09	0.182	Remove

PATCH NUMBER	EVC	LARGE TREE	TREE CANOPY	WEEDS	UNDERSTORY	RECRUITMENT	TREELESS RECRUITMENT	LITTER	LOGS	HABITAT	LNSCP CNXT	HH SCORE	HABITAT HECTARES	RETENTION
12	Plains Swampy Woodland	0	0	7	5	0	NA	4	0	16	2	0.18	0.001	Remove
5	Swampy Riparian Woodland	0	0	2	5	1		2	1	11	2	0.13	0.056	Retain
6	Swampy Riparian Woodland	0	5	0	5	0		2	2	14	2	0.16	0.027	Retain
7	Swampy Riparian Woodland	0	0	0	5	0		3	0	8	2	0.1	0.051	Retain
8	Swampy Riparian Woodland	0	0	0	5	5		2	2	14	2	0.16	0.316	Retain
28	Swampy Riparian Woodland	0	0	0	5	0		3	0	8	2	0.1	0.008	Retain
29	Swampy Riparian Woodland	0	4	0	5	1		5	1	16	2	0.18	0.012	Retain
30	Swampy Riparian Woodland	0	0	0	5	0		3	0	8	2	0.1	0.008	Retain
31	Swampy Riparian Woodland	0	0	0	5	1		3	0	9	2	0.11	0.032	Retain
32	Swampy Riparian Woodland	0	0	0	5	0		3	0	8	2	0.1	0.007	Retain

PATCH NUMBER	EVC	LARGE TREE	TREE CANOPY	WEEDS	UNDERSTORY	RECRUITMENT	TREELESS RECRUITTMENT	LITTER	LOGS	HABITAT	LNSCP CNXT	HH SCORE	HABITAT HECTARES	RETENTION
33	Swampy Riparian Woodland	0	0	0	5	3		2	1	11	2	0.13	0.019	Retain
34	Swampy Riparian Woodland	0	0	0	5	0		3	0	8	2	0.1	0.018	Retain
21	Swampy Riparian Woodland	0	5	0	5	0		3	2	15	2	0.17	0.042	Retain
22	Swampy Riparian Woodland	0	5	0	5	0		3	2	15	2	0.17	0.024	Retain
23	Swampy Riparian Woodland	0	5	0	5	0		3	2	15	2	0.17	0.041	Retain
24	Swampy Riparian Woodland	0	0	0	5	0		2	1	8	2	0.1	0.005	Retain
25	Swampy Riparian Woodland	0	0	0	5	5		2	2	14	2	0.16	0.016	Retain
27	Swampy Riparian Woodland	0	2	0	5	1		3	0	11	2	0.13	0.007	Retain
36	Swampy Riparian Woodland	0	0	0	5	1		3	1	10	2	0.12	0.032	Retain
37	Swampy Riparian Woodland	0	0	0	5	1		3	0	9	2	0.11	0.007	Retain

PATCH NUMBER	EVC	LARGE TREE	TREE CANOPY	WEEDS	UNDERSTORY	RECRUITMENT	TREELESS RECRUITTMENT	LITTER	LOGS	HABITAT	LNSCP CNXT	HH SCORE	HABITAT HECTARES	RETENTION
38	Swampy Riparian Woodland	0	0	0	5	1		3	0	9	2	0.11	0.008	Retain
14	Swampy Riparian Woodland	0	0	4	5	0	3	2	0	13	2	0.15	0.015	Retain
15	Swampy Riparian Woodland	0	5	0	5	0		2	5	17	2	0.19	0.031	Retain
16	Swampy Riparian Woodland	0	0	0	5	5		2	1	13	2	0.15	0.065	Retain
17	Swampy Riparian Woodland	0	2	2	5	3		5	1	18	2	0.2	0.141	Retain
19	Swampy Riparian Woodland	0	2	2	5	3		5	1	18	2	0.2	0.091	Retain
10	Tall Marsh	0	0	7	15	0	3	3	0	28	2	0.3	0.045	Retain
35	Tall Marsh	0	0	6	5	0	3	3	0	17	2	0.19	0.042	Retain
20	Tall Marsh	0	0	6	15	0	3	3	0	27	2	0.29	0.021	Retain

APPENDIX E

TREE DATA

Table E.1 Scattered trees

TREE ID	SPECIES	COMMON NAME	DBH (CM)	TPZ RADIUS (m)	RETENTION
1	*Eucalyptus ovata*	Swamp Gum	23	8.5	remove
2	*Eucalyptus camaldulensis*	River Red Gum	17	6.5	remove
3	*Eucalyptus viminalis*	Manna Gum	9	3.4	remove
4	*Eucalyptus polyanthemos*	Red Box	8	3	remove
5	*Eucalyptus camaldulensis*	River Red Gum	5	2	remove
6	*Eucalyptus camaldulensis*	River Red Gum	4	2	remove
7	*Eucalyptus viminalis*	Manna Gum	7	2.6	remove
8	*Eucalyptus polyanthemos*	Red Box	7	4.7	remove
9	*Eucalyptus viminalis*	Manna Gum	25	9.5	remove
10	*Eucalyptus melliodora*	Yellow Box	11	4	remove
11	*Eucalyptus leucoxylon*	Yellow Gum	8	3	remove
12	*Eucalyptus viminalis*	Manna Gum	7	3.6	remove
13	*Eucalyptus camaldulensis*	River Red Gum	14	5.4	remove
14	*Eucalyptus camaldulensis*	River Red Gum	7	2.8	remove
15	*Eucalyptus viminalis*	Manna Gum	16	7.4	remove
16	*Eucalyptus viminalis*	Manna Gum	10	3.8	remove
17	*Eucalyptus camaldulensis*	River Red Gum	17		remove
18	*Eucalyptus polyanthemos*	Red Box	8	3	remove
19	*Eucalyptus polyanthemos*	Red Box	8	2.9	remove
20	*Eucalyptus viminalis*	Manna Gum	9	3.4	remove
21	*Eucalyptus ovata*	Swamp Gum	27	10.2	remove
22	*Eucalyptus camaldulensis*	River Red Gum	11	4.1	remove
23	*Eucalyptus ovata*	Swamp Gum	40	15	remove
24	*Eucalyptus viminalis*	Manna Gum	8	3.9	remove
25	*Eucalyptus viminalis*	Manna Gum	15	7.1	remove
26	*Eucalyptus viminalis*	Manna Gum	12	4.4	remove
27	*Eucalyptus radiata*	Narrow-leaved Peppermint	20	9.8	remove
28	*Eucalyptus camaldulensis*	River Red Gum	20	7.4	remove
29	*Eucalyptus ovata*	Swamp Gum	22	8.3	remove
30	*Eucalyptus camaldulensis*	River Red Gum	13	4.9	remove

TREE ID	SPECIES	COMMON NAME	DBH (CM)	TPZ RADIUS (m)	RETENTION
31	*Eucalyptus ovata*	Swamp Gum	32	12	remove
32	*Eucalyptus viminalis*	Manna Gum	10	3.7	remove
33	*Eucalyptus viminalis*	Manna Gum	16	5.9	remove
34	*Eucalyptus viminalis*	Manna Gum	7	2.5	remove
35	*Eucalyptus camaldulensis*	River Red Gum	11	4	remove

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With approximately 48,000 talented people globally, we engineer projects that will help societies grow for lifetimes to come.